

part, in individual channels that conform to the requirements of SAE Recommended Practice J211, October 1988, with channel classes as set out in the following table C.

TABLE C

Device	Channel
Head acceleration	Class 1000
Pendulum acceleration	Class 60
Thorax acceleration	Class 180
Femur-force	Class 600

The mountings for sensing devices shall have no resonance frequency within a range of 3 times the frequency range of the applicable channel class.

§ 572.78 Performance test conditions.

(a) Conduct performance tests at any temperature from 66 °F to 78 °F, and at any relative humidity from 10 percent to 70 percent, but only after having first exposed the dummy to these conditions for a period of not less than 4 hours.

(b) For the performance tests specified in § 572.72 (head), § 572.74 (thorax), § 572.75 (lumbar spine, abdomen, and pelvis), and § 572.76 (limbs), position the dummy as set out in paragraph (c) of this section.

(c) Place the dummy on a horizontal seating surface covered by teflon sheeting so that the dummy's midsagittal plane is vertical and centered on the test surface.

(1) The seating surface is flat, rigid, clean, and dry, with a smoothness not exceeding 40 microinches, a length of at least 16 inches, and a width of at least 16 inches.

(2) For head impact tests, the seating surface has a vertical back support whose top is 12.4 ±0.2 inches above the horizontal surface, and the rear surfaces of the dummy's back and buttocks touch the back support as shown in Figure 40.

(3) For the thorax, lumbar spine, and knee tests, the horizontal surface is without a back support as shown in Figure 41 (for the thorax); Figure 42 (for the lumbar spine); and Figure 43 (for the knee).

(4) Position the dummy's arms and legs so that their center lines are in planes parallel to the midsagittal plane.

(5) Adjust each shoulder yoke so that with its upper surface horizontal, a yoke is at the midpoint of its anterior-posterior travel.

(6) Adjust the dummy for head and knee impact tests so that the rear surfaces of the shoulders and buttocks are tangent to a transverse vertical plane.

(d) The dummy's dimensions are specified in drawings SA 106C 001, sheet 3, Revision A, July 11, 1997, and sheets 4 through 6.

(e) Unless otherwise specified in this regulation, performance tests of the same component, segment, assembly or fully assembled dummy are separated in time by a period of not less than 20 minutes.

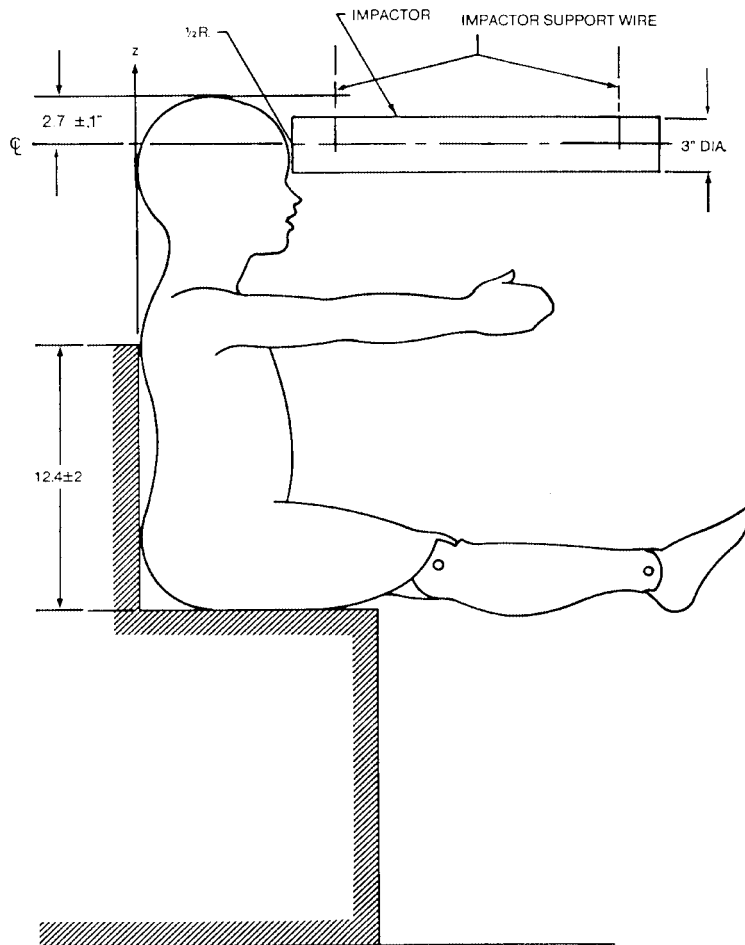
(f) Unless otherwise specified in this regulation, the surfaces of the dummy components are not painted.

[56 FR 57836, Nov. 14, 1991, as amended at 62 FR 44227, Aug. 20, 1997]

FIGURES TO SUBPART I OF PART 572

FIGURE 40
HEAD IMPACT TEST SET-UP

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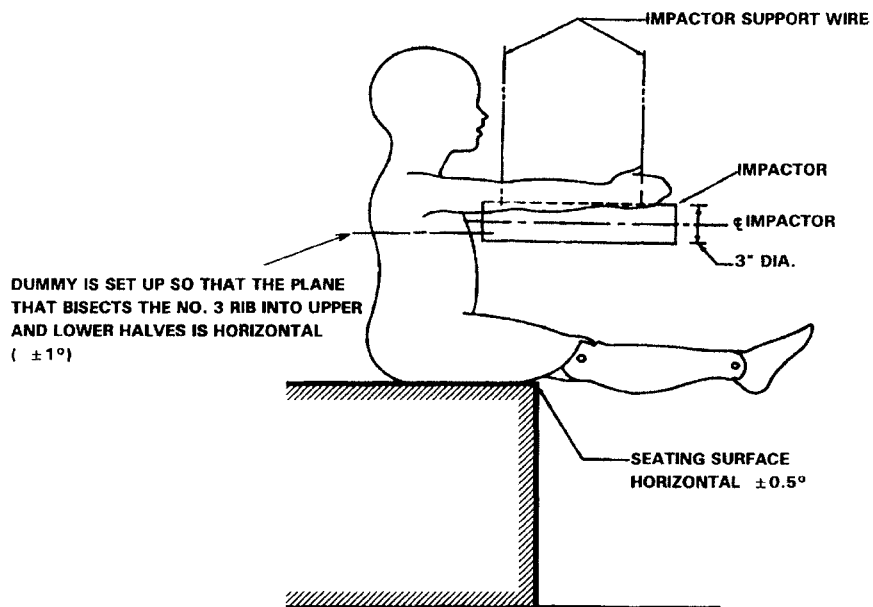
NOTES: 1. DUMMY IMPACT SENSORS NOT USED IN THIS TEST MAY BE REPLACED BY EQUIVALENT DEAD WEIGHTS.

2. NO EXTERNAL SUPPORTS ARE REQUIRED ON THE DUMMY TO MEET SET-UP SPECIFICATIONS.

3. THE MIDSAGITTAL PLANE OF THE DUMMY IS VERTICAL WITHIN ± 1 DEG.

4. THE MIDSAGITTAL PLANE OF THE HEAD IS CENTERED WITH RESPECT TO THE LONGITUDINAL CENTERLINE OF THE PENDULUM WITHIN 0.12 IN.

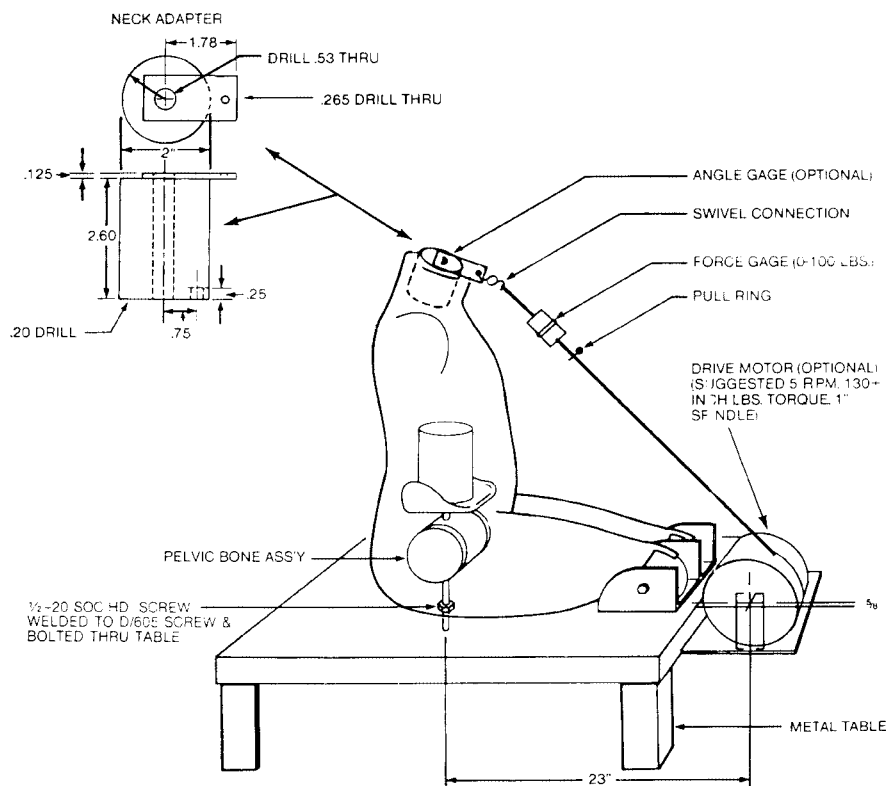
FIGURE 41
THORAX IMPACT TEST SET-UP



- NOTES:
1. DUMMY IMPACT SENSORS NOT USED IN THIS TEST MAY BE REPLACED BY EQUIVALENT DEAD WEIGHTS.
 2. NO EXTERNAL SUPPORTS ARE REQUIRED ON THE DUMMY TO MEET SET-UP SPECIFICATIONS.
 3. THE MIDSAGITTAL PLANE OF THE DUMMY IS VERTICAL WITHIN ± 1 DEG.
 4. THE MIDSAGITTAL PLANE OF THE THORAX IS CENTERED WITH RESPECT TO THE LONGITUDINAL CENTERLINE OF THE PENDULUM WITHIN 0.12 IN.

[60 FR 2898, Jan. 12, 1995]

FIGURE 42
LUMBAR SPINE FLEXION TEST SET-UP



NOTES: 1. DUMMY IMPACT SENSORS NOT USED IN THIS TEST MAY BE REPLACED BY EQUIVALENT DEAD WEIGHTS.

2. NO EXTERNAL SUPPORTS ARE REQUIRED ON THE DUMMY TO MEET SET-UP SPECIFICATIONS.

3. THE MIDSAGITTAL PLANE OF THE DUMMY IS VERTICAL WITHIN ± 1 DEG.

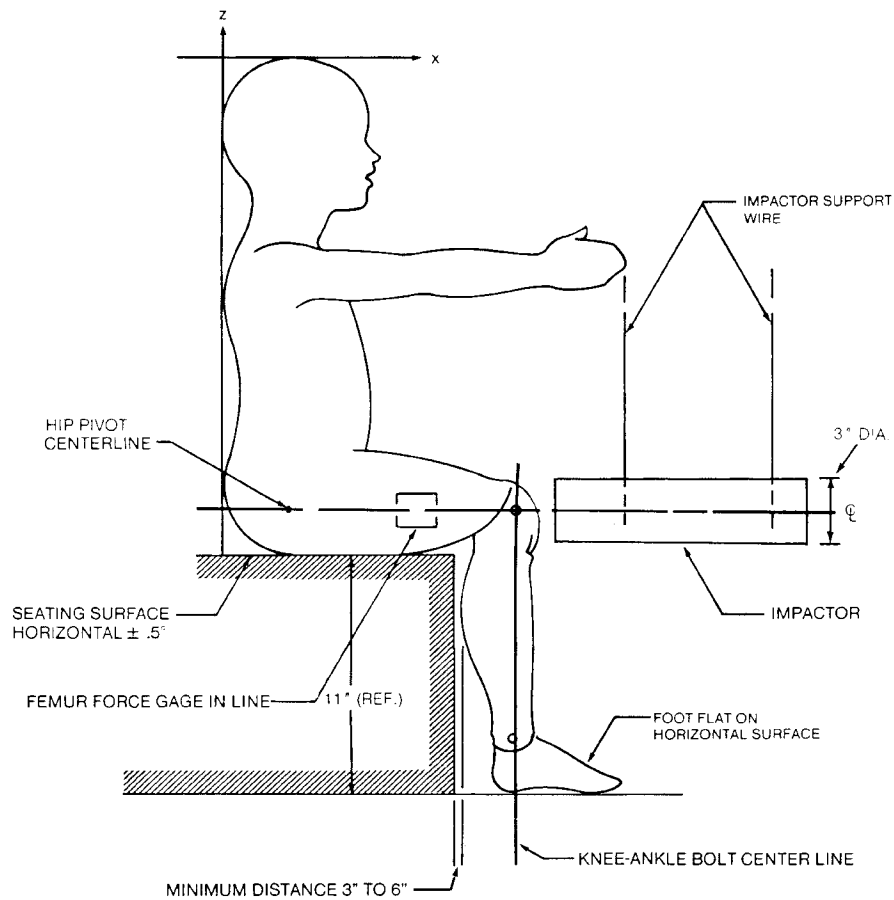
4. THE DUMMY IN THE SEATED POSITION IS FIRMLY AFFIXED TO THE TEST BENCH AT THE PELVIC BONE AND AT THE KNEES.

5. THE PULL-FLEXION FORCE, APPLIED THROUGH A RIGID NECK ADAPTOR WHICH IS MOUNTED ON TOP OF THE THORACIC STERNUM ASSEMBLY (C/601), IS ALIGNED WITH THE MIDSAGITTAL PLANE OF THE DUMMY WITHIN ± 1 DEG.

6. THE SWIVEL FOR THE FORCE MEASURING SENSOR MUST NOT BIND OR BOTTOM OUT THROUGH THE ENTIRE LOADING CYCLE.

FIGURE 43
KNEE IMPACT TEST SET-UP

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- NOTES:
1. DUMMY IMPACT SENSORS NOT USED IN THIS TEST MAY BE REPLACED BY EQUIVALENT DEAD WEIGHTS.
 2. NO EXTERNAL SUPPORTS ARE REQUIRED ON THE DUMMY TO MEET SET-UP SPECIFICATIONS.
 3. THE MIDSAGITTAL PLANE OF THE DUMMY IS VERTICAL WITHIN $\pm 1^\circ$ DEG.
 4. CENTERLINE OF THE IMPACTED FEMUR IS ALIGNED WITH THE CENTERLINE OF THE IMPACTOR AND THE PLANE OF THE IMPACTOR MOTION WITHIN $\pm 1^\circ$ DEG.

Subpart J—9-Month Old Child

§ 572.80 Incorporated materials.

SOURCE: 56 FR 41080, Aug. 19, 1991, unless otherwise noted.

The drawings and specifications referred to in § 572.81(a) that are not set forth in full are hereby incorporated in

§ 572.81

this part by reference. These materials are thereby made part of this regulation. The Director of the Federal Register approved the materials incorporated by reference in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies of the materials may be obtained from Rowley-Scher Reprographics, Inc., 1216 K Street, NW., Washington, DC 20002, telephone (202) 628-6667. Copies are available for inspection in the general reference section of Docket 89-11, Docket Section, National Highway Traffic Safety Administration, room 5109, 400 Seventh Street, SW., Washington, DC, or at the Office of the Federal Register, 800 North Capitol Street, NW., suite 700, Washington, DC.

§ 572.81 General description.

(a) The dummy consists of: (1) The assembly specified in drawing LP 1049/A, March 1979, which is described in its entirety by means of approximately 54 separate drawings and specifications, 1049/1 through 1049/54; and (2) a parts list LP 1049/0 (5 sheets); and (3) a report entitled, "The TNO P3/4 Child Dummy Users Manual," January 1979, published by Instituut voor Wegtransportmiddelen TNO.

(b) Adjacent dummy segments are joined in a manner such that throughout the range of motion and also under simulated crash-impact conditions there is no contact between metallic elements except for contacts that exist under static conditions.

(c) The structural properties of the dummy are such that the dummy conforms to this part in every respect both before and after being used in dynamic tests such as that specified in Standard No. 213 of this chapter (§ 571.213).

§ 572.82 Head.

The head consists of the assembly shown in drawing LP 1049/A and conforms to each of the applicable drawings listed under LP 1049/0 through 54.

§ 572.83 Head-neck.

The head-neck assembly shown in drawing 1049/A consists of parts specified as items 1 through 16 and in item 56.

49 CFR Ch. V (10-1-03 Edition)

§ 572.84 Thorax.

The thorax consists of the part of the torso shown in assembly drawing LP 1049/A and conforms to each of the applicable drawings listed under LP 1049/0 through 54.

§ 572.85 Lumbar spine flexure.

(a) When subjected to continuously applied force in accordance with paragraph (b) of this section, the lumbar spine assembly shall flex by an amount that permits the thoracic spine to rotate from its initial position in accordance with Figure No. 18 of § 572.21 (49 CFR part 572) by 40 degrees at a force level of not less than 18 pounds and not more than 22 pounds, and straighten upon removal of the force to within 5 degrees of its initial position.

(b) *Test procedure.* (1) The lumbar spine flexure test is conducted on a dummy assembly as shown in drawing LP 1049/A, but with the arms (which consist of parts identified as items 17 through 30) and all head-neck parts (identified as items 1 through 13 and 59 through 63), removed.

(2) With the torso assembled in an upright position, adjust the lumbar cable by tightening the adjustment nut for the lumbar vertebrae until the spring is compressed to $\frac{2}{3}$ of its unloaded length.

(3) Position the dummy in an upright seated position on a seat as indicated in Figure No. 18 of § 572.21 (lower legs do not need to be removed, but must be clamped firmly to the seating surface), ensuring that all dummy component surfaces are clean, dry and untreated unless otherwise specified.

(4) Firmly affix the dummy to the seating surface through the pelvis at the hip joints by suitable clamps that also prevent any relative motion with respect to the upper legs during the test in § 572.65(c)(3) of this part. Install a pull attachment at the neck to torso juncture as shown in Figure 18 of § 572.21.

(5) Flex the thorax forward 50 degrees and then rearward as necessary to return it to its initial position.

(6) Apply a forward pull force in the midsagittal plane at the top of the neck adapter so that at 40 degrees of the lumbar spine flexion the applied force is perpendicular to the thoracic

spine box. Apply the force at any torso deflection rate between 0.5 and 1.5 degrees per second up to 40 degrees of flexion but no further; maintain 40 degrees of flexion for 10 seconds, and record the highest applied force during that time. Release all force as rapidly as possible and measure the return angle three minutes after release.

§ 572.86 Test conditions and dummy adjustment.

(a) With the complete torso on its back lying on a horizontal surface and the neck assembly mounted and shoulders on the edge of the surface, adjust the neck such that the head bolt is lowered 0.40 ± 0.05 inches (10 ± 1 mm) after a vertically applied load of 11.25 pounds (50 N) applied to the head bolt is released.

(b) With the complete torso on its back with the adjusted neck assembly as specified in § 572.66(a), and lying on a horizontal surface with the shoulders on the edge of the surface, mount the head and tighten the head bolt and nut firmly, with the head in horizontal position. Adjust the head joint at the force between 1-2g, which just supports the head's weight.

(c) Using the procedures described below, limb joints are set at the force between 1-2g, which just supports the limbs' weight when the limbs are extended horizontally forward:

(1) With the complete torso lying with its front down on a horizontal surface, with the hip joint just over the edge of the surface, mount the upper leg and tighten hip joint nut firmly. Adjust the hip joint by releasing the hip joint nut until the upper leg just starts moving.

(2) With the complete torso and upper leg lying with its front up on a horizontal surface, with the knee joint just over the edge of the surface, mount the lower leg and tighten knee joint nut firmly. Adjust the knee joint by releasing the knee joint nut until the lower leg just starts moving.

(3) With the torso in an upright position, mount the upper arm and tighten firmly the adjustment bolts for the shoulder joint with the upper arm placed in a horizontal position. Adjust the shoulder joint by releasing the

shoulder joint nut until the upper arm just starts moving.

(4) With the complete torso in an upright position and upper arm in a vertical position, mount the forearm in a horizontal position and tighten the elbow hinge bolt and nut firmly. Adjust the elbow joint nut until the forearm just starts moving.

(d) With the torso assembled in an upright position, the adjustment nut for the lumbar vertebrae is tightened until the spring is compressed to $\frac{2}{3}$ of its unloaded length.

(e) Performance tests are conducted at any temperature from 66 to 78 degrees F and at any relative humidity from 10 percent to 70 percent after exposure of the dummy to these conditions for a period of not less than four hours.

(f) Performance tests of the same component, segment, assembly or fully assembled dummy are separated in time by a period of not less than 20 minutes unless otherwise specified.

(g) Surfaces of the dummy components are not painted except as specified in the part or in drawings incorporated by this part.

Subpart K—Newborn Infant

SOURCE: 58 FR 3232, Jan. 8, 1993, unless otherwise noted.

§ 572.90 Incorporation by reference.

(a) The drawings and specifications referred to in § 572.91(a) are hereby incorporated in subpart K by reference. These materials are thereby made part of this regulation. The Director of the Federal Register approved that materials incorporated by reference in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies of the materials may be inspected at NHTSA's Docket Section, 400 Seventh Street, SW., room 5109, Washington, DC, or at the Office of the Federal Register, 800 North Capitol Street, NW., suite 700, Washington, DC.

(b) The incorporated material is available as follows:

(1) Drawing numbers 126-0000 through 126-0015 (sheets 1 through 3), 126-0017 through 126-0027, and a parts list entitled "Parts List for CAMI Newborn Dummy," are available from Reprographic Technologies, 1111 14th

§ 572.91

Street, NW., Washington, DC 20005. (202) 628-6667.

(2) A construction manual entitled, "Construction of the Newborn Infant Dummy" (July 1992) is available from Reprographic Technologies at the address in paragraph (b)(1) of this section.

§ 572.91 General description.

(a) The representative newborn infant dummy consists of a drawings and specifications package that contains the following materials:

(1) Drawing numbers 126-0000 through 126-0015 (sheets 1 through 3), 126-0017 through 126-0027, and a parts list entitled "Parts List for CAMI Newborn Dummy"; and,

(2) A construction manual entitled, "Construction of the Newborn Infant Dummy" (July 1992).

(b) The structural properties of the dummy are such that the dummy conforms to this part in every respect both before and after being used in dynamic tests specified in Standard No. 213 of this chapter (§ 571.213).

Subpart L—Free Motion Headform

SOURCE: 60 FR 43058, Aug. 18, 1995, unless otherwise noted.

§ 572.100 Incorporation by Reference.

(a) The drawings and specifications referred to in § 572.101 are hereby incorporated in subpart L by reference. These materials are thereby made part of this regulation. The Director of the Federal Register approved the materials incorporated by reference in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies of the materials may be inspected at NHTSA's Docket Section, 400 Seventh Street, S.W., room 5109, Washington, DC, or at the Office of the Federal Register, 800 North Capitol Street, N.W., Washington, DC.

(b) The incorporated material is available as follows:

(1) Drawing number 92041-001, "Head Form Assembly," (November 30, 1992); drawing number 92041-002, "Skull Assembly," (November 30, 1992); drawing number 92041-003, "Skull Cap Plate Assembly," (November 30, 1992); drawing number 92041-004, "Skull Cap Plate," (November 30, 1992); drawing number 92041-005, "Threaded Pin," (November

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30, 1992); drawing number 92041-006, "Hex Nut," (November 30, 1992); drawing number 92041-008, "Head Skin without Nose," (November 30, 1992, as amended March 6, 1995); drawing number 92041-009, "Six-Axis Load Cell Simulator Assembly," (November 30, 1992); drawing number 92041-011, "Head Ballast Weight," (November 30, 1992); drawing number 92041-018, "Head Form Bill of Materials," (November 30, 1992); drawing number 78051-148, "Skull-Head (cast) Hybrid III," (May 20, 1978, as amended August 17, 1978); drawing number 78051-228/78051-229, "Skin-Hybrid III," (May 20, 1978, as amended through September 24, 1979); drawing number 78051-339, "Pivot Pin-Neck Transducer," (May 20, 1978, as amended May 14, 1986); drawing number 78051-372, "Vinyl Skin Formulation Hybrid III," (May 20, 1978); and drawing number C-1797, "Neck Blank," (August 1, 1989); drawing number SA572-S4, "Accelerometer Specification," (November 30, 1992), are available from Reprographic Technologies, 1111 14th Street, N.W., Washington, DC 20005.

(2) A user's manual entitled "Free-Motion Headform User's Manual," version 2, March 1995, is available from NHTSA's Docket Section at the address in paragraph (a) of this section.

(3) SAE Recommended Practice J211, OCT 1988, "Instrumentation for Impact Tests," Class 1000, is available from The Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.

§ 572.101 General description.

(a) The free motion headform consists of the component assembly which is shown in drawings 92041-001 (incorporated by reference; see § 572.100), 92041-002 (incorporated by reference; see § 572.100), 92041-003 (incorporated by reference; see § 572.100), 92041-004 (incorporated by reference; see § 572.100), 92041-005 (incorporated by reference; see § 572.100), 92041-006 (incorporated by reference; see § 572.100), 92041-008 (incorporated by reference; see § 572.100), 92041-009 (incorporated by reference; see § 572.100), 92041-011 (incorporated by reference; see § 572.100), 78051-148 (incorporated by reference; see § 572.100),

78051-228/78051-229 (incorporated by reference; see §572.100), 78051-339 (incorporated by reference; see §572.100), 78051-372 (incorporated by reference; see §572.100), C-1797 (incorporated by reference; see §572.100), and SA572-S4 (incorporated by reference; see §572.100).

(b) Disassembly, inspection, and assembly procedures, and sign convention for the signal outputs of the free motion headform accelerometers, are set forth in the Free-Motion Headform User's Manual (incorporated by reference; see §572.100).

(c) The structural properties of the headform are such that it conforms to this part in every respect both before and after being used in the test specified in Standard No. 201 of this chapter (§571.201).

(d) The outputs of accelerometers installed in the headform are recorded in individual data channels that conform to the requirements of SAE Recommended Practice J211, OCT 1988, "Instrumentation for Impact Tests," Class 1000 (incorporated by reference; see §572.100).

§572.102 Drop test.

(a) When the headform is dropped from a height of 14.8 inches in accordance with paragraph (b) of this section, the peak resultant accelerations at the location of the accelerometers mounted in the headform as shown in drawing 92041-001 (incorporated by reference; see §572.100) shall not be less than 225g, and not more than 275g. The acceleration/time curve for the test shall be unimodal to the extent that oscillations occurring after the main acceleration pulse are less than ten percent (zero to peak) of the main pulse. The lateral acceleration vector shall not exceed 15g (zero to peak).

(b) *Test procedure.* (1) Soak the headform in a test environment at any temperature between 19 degrees C. to 26 degrees C. and at a relative humidity from 10 percent to 70 percent for a pe-

riod of at least four hours prior to its use in a test.

(2) Clean the headform's skin surface and the surface of the impact plate with 1,1,1 Trichloroethane or equivalent.

(3) Suspend the headform, as shown in Figure 50. Position the forehead below the chin such that the skull cap plate is at an angle of 28.5 ± 0.5 degrees with the impact surface when the midsagittal plane is vertical.

(4) Drop the headform from the specified height by means that ensure instant release onto a rigidly supported flat horizontal steel plate, which is 2 inches thick and 2 feet square. The plate shall have a clean, dry surface and any microfinish of not less than 8 microinches 203.2×10^{-6} mm (rms) and not more than 80 microinches 2032×10^{-6} mm (rms).

(5) Allow at least 3 hours between successive tests on the same headform.

§572.103 Test conditions and instrumentation.

(a) Headform accelerometers shall have dimensions, response characteristics, and sensitive mass locations specified in drawing SA572-S4 (incorporated by reference; see §572.100) and be mounted in the headform as shown in drawing 92041-001 (incorporated by reference; see §572.100).

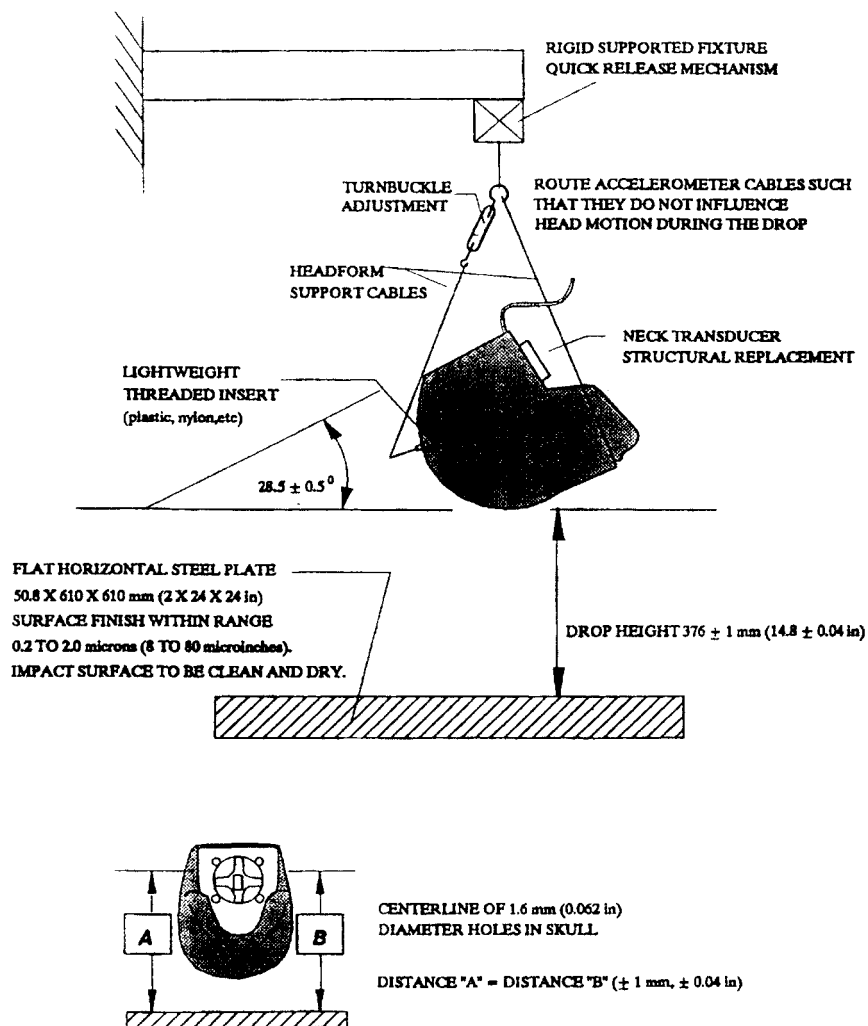
(b) The outputs of accelerometers installed in the headform are recorded in individual data channels that conform to the requirements of SAE Recommended Practice J211, OCT 1988, "Instrumentation for Impact Tests," Class 1000 (incorporated by reference; see §572.100).

(c) Coordinate signs for instrumentation polarity conform to the sign convention shown in the Free-Motion Headform User's Manual (incorporated by reference; see §572.100).

(d) The mountings for accelerometers shall have no resonant frequency within a range of 3 times the frequency range of the applicable channel class.

Figure 50

HEADFORM DROP TEST Set-Up Specifications



[60 FR 43060, Aug. 18, 1995]

Subpart M—Side Impact Hybrid Dummy 50th Percentile Male

SOURCE: 63 FR 41470, Aug. 4, 1998, unless otherwise noted.

§572.110 Materials incorporated by reference.

(a) The following materials are hereby incorporated by reference in Subpart M:

(1) The Anthropomorphic Test Dummy Parts List, SID/Hybrid III part 572, subpart M, dated May 10, 1997.

(2) The SID/Hybrid III Part 572 Subpart M User's Manual, dated May 1997.

(3) Drawing number 96-SIDH3-001, titled, "Head-Neck Bracket," dated August 30, 1996.

(4) Drawing number 96-SIDH3-006, titled, "Upper and Middle Shoulder Foam," dated May 10, 1997.

(5) Drawing number SA-SIDH3-M001, titled, "Complete Assembly SIDH3," dated April 19, 1997.

(6) Drawing number 78051-61X, Revision C, titled "Head Assembly—complete," dated March 28, 1997.

(7) Drawing number 78051-90, Revision A, titled "Neck Assembly—complete," dated May 20, 1978.

(8) Dummy assembly drawing number SA-SID-M030, Revision A, titled "Thorax Assembly—complete," dated May 18, 1994.

(9) Dummy assembly drawing SA-SID-M050, revision A, titled "Lumbar Spine Assembly," dated May 18, 1994.

(10) Dummy assembly drawing SA-150 M060, revision A, titled "Pelvis and Abdomen Assembly," dated May 18, 1994.

(11) Dummy assembly drawing SA-SID-053, revision A, titled "Lumbar Spine Assembly," dated May 18, 1994.

(12) Dummy assembly drawing SA-SID-M080, titled "Leg Assembly, Right," dated August 13, 1987.

(13) Dummy assembly drawing SA-SID-M081, titled "Leg Assembly, Left," dated August 13, 1987.

(14) Drawing number 78051-383X, Revision P, titled "Neck Transducer Structural Replacement," dated November 1, 1995.

(15) The Society of Automotive Engineers (SAE) J1733 Information Report, titled "Sign Convention for Vehicle Crash Testing," dated December 1994.

(16) SAE Recommended Practice J211, "Instrumentation for Impact Tests," Parts 1 and 2, dated March 1995.

(b) The incorporated materials are available as follows:

(1) The Director of the Federal Register approved those materials incorporated by reference in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies of the materials may be inspected at NHTSA's Docket Section, 400 Seventh Street S.W., room 5109, Washington, DC, or at the Office of the Federal Register, 800 North Capitol Street, N.W., Suite 700, Washington, DC.

(2) The parts lists, user's manual and drawings referred to in paragraphs (a)(1) through (a)(14) of this section are available from Reprographic Technologies, 9000 Virginia Manor Road, Beltsville, MD 20705 (301) 419-5070.

(3) The SAE materials referred to in paragraphs (a)(15) and (a)(16) of this section are available from the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.

§572.111 General description.

(a) The dummy consists of component parts and component assemblies defined in drawing SA-SIDH3-M001, dated April 19, 1997, which are described in approximately 200 drawings and specifications that are set forth in §§ 572.32, 572.33 and 572.41(a)(3),(4),(5) and (6) of this part, and in the drawing of the Adaptor Bracket 96-SIDH3-001.

(1) The head assembly consists of the assembly specified in subpart E (§572.32) and conforms to each of the drawings subtended under drawing 78051-61X rev. C.

(2) The neck assembly consists of the assembly specified in subpart E (§572.33) and conforms to each of the drawings subtended under drawing 78051-90 rev. A.

(3) The thorax assembly consists of the assembly shown as number SID 053 and conforms to each applicable drawing subtended by number SA-SID M030 rev. A.

(4) The lumbar spine consists of the assembly specified in subpart B (§572.9(a)) and conforms to drawing SA 150 M050 and drawings subtended by SA-SID M050 rev. A.

(5) The abdomen and pelvis consist of the assembly and conform to the drawings subtended by SA 150 M060, the drawings subtended by SA 150 M060 rev. A and the drawings subtended by SA-SID-087 sheet 1 rev. H, and SA-SID-87 sheet 2 rev. H.

(6) The lower limbs consist of the assemblies specified in Subpart B (§ 572.10) shown as SA 150 M080 and SA 150 M081 in Figure 1 and SA-SID-M080 and SA-SID-M081 and conform to the drawings subtended by those numbers.

(7) The neck mounting adaptor bracket conforms to drawing 96-SIDH3-001.

(8) Upper and middle shoulder foams conform to drawing 96-SIDH3-006.

(b) The structural properties of the dummy are such that the dummy conforms to the specifications of this subpart in every respect before being used in vehicle tests specified in Standard 201.

(c) Disassembly, inspection and assembly procedures, external dimensions, weight and drawing list are set forth in the SIDH3 User's Manual, dated May 1997.

(d) Sign convention for signal outputs is given in the reference document SAE J1733 of 1994-12, "Sign Convention for Vehicle Crash Testing."

§ 572.112 Head assembly.

The head assembly consists of the head (drawing 78051-61X, rev. C) with the neck transducer structural replacement (drawing 78051-383X, rev. P) and three (3) accelerometers that are mounted in conformance to § 572.36 (c).

(a) Test procedure. (1) Soak the head assembly in a test environment at any

temperature between 18.9 and 25.6 degrees C. (66 to 78 degrees F.) and at a relative humidity between 10 percent and 70 percent for a period of at least four (4) hours prior to its application in a test.

(2) Clean the impact surface of the head skin and impact plate surface, described in paragraph (a)(4) of this section, with 1,1,1 trichloroethane or equivalent prior to the test.

(3) Suspend the head, as shown in Figure 51, so that the midsagittal plane makes an angle of 35 ± 1 degrees with the impact surface and its anterior-posterior axis is horizontal ± 1 degree.

(4) Drop the head from a height of 200 ± 0.25 mm (7.87 ± 0.01 inches), measured from the lowest point on the head, by a means that ensures a smooth, clean release into a rigidly supported flat horizontal steel plate, which is 51 ± 2 mm (2.0 ± 0.01 in.) thick and 610 ± 10 mm (24.0 ± 0.4 in) square. The plate shall have a dry surface and shall have a micro-finish of 0.2 microns (8 microinches) to 2.0 microns (80 microinches).

(5) Allow at least two (2) hours between successive tests on the same head.

(b) Performance criteria. (1) When the head assembly is dropped in accordance with § 572.112(a), the measured peak resultant acceleration shall be between 120 and 150 G's.

(2) The resultant acceleration-time curve shall be unimodal to the extent that oscillations occurring after the main acceleration pulse shall not exceed 15 percent (zero to peak) of the main pulse. The longitudinal acceleration vector shall not exceed 15 G's.

Figure 51
HEAD DROP TEST

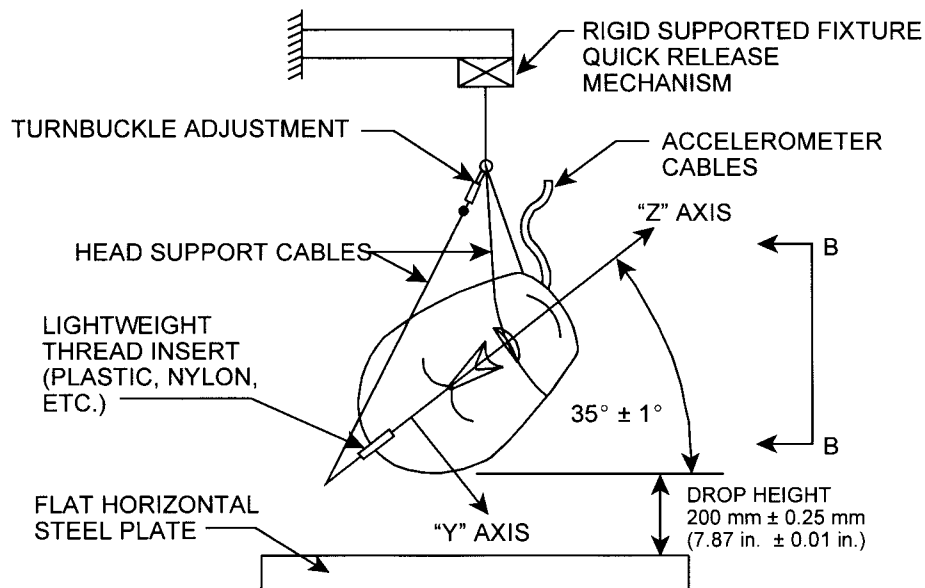
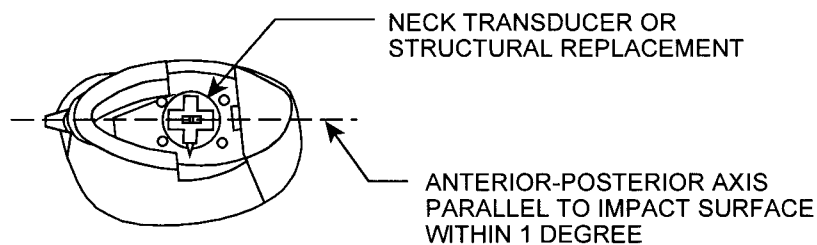


Plate is 51 mm x 610 mm x 610 mm (2 x 24 x 24 in.)
with SURFACE FINISH 0.2 microns (8 microinches) to
2.0 microns (80 microinches). IMPACT SURFACE to be
clean and dry.



VIEW B-B

§572.113 Neck assembly.

The head/neck assembly consists of
the parts 78051-61X, rev. C; -84; -90, rev.
A; -94; -98; -104, revision F; -303, rev.

E; -305; -306; -307, rev. X and has a six
axis neck transducer (drawing C-1709,
revision D) installed in conformance
with §572.36(d).

§ 572.114

(a) Test procedure. (1) Soak the head and neck assembly in a test environment at any temperature between 20.6 and 22.2 degrees C. (69 to 72 degrees F.) and at any relative humidity between 10 percent and 70 percent for a period of at least four (4) hours prior to its application in a test.

(2) Torque the jamnut (78051-64) on the neck cable (78051-301, rev. E) to 1.35 ± 0.27 Nm (1.0 ± 0.2 ft-lb) before each test.

(3) Using neck brackets 78051-303 and -307, mount the head/neck assembly to the part 572 pendulum test fixture (see § 572.33, Figure 22,) so that the midsagittal plane of the head is vertical and perpendicular to the plane of motion of the pendulum's longitudinal centerline (see § 572.33, Figure 20, except that the direction of the head/neck assembly is rotated around the superior-inferior axis by an angle of 90 degrees). Install suitable transducers or other devices necessary for measuring the "D" plane (horizontal surface at the base of the skull) rotation with respect to the pendulum's longitudinal centerline. The rotation can be measured by placing a transducer at the occipital condyles and another at the intersection of the centerline of the neck and the line extending from the base of the neck as shown in figure 52.

(4) Release the pendulum and allow it to fall freely from a height to achieve an impact velocity of 6.89 to 7.13 m/s (22.6 to 23.4 ft/sec) measured at the center of the pendulum accelerometer.

(5) Allow the neck to flex without the head or neck contacting any object during the test.

(6) Time zero is defined as the time of initial contact between the striker plate and the pendulum deceleration medium.

(7) Allow a period of at least thirty (30) minutes between successive tests on the same neck assembly.

(b) Performance criteria. (1) The pendulum deceleration pulse is to be characterized in terms of decrease in veloc-

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ity as obtained by integrating the pendulum acceleration output.

Time (ms)	Pendulum Delta-V (m/s)
10	1.96 to 2.55.
20	4.12 to 5.10.
30	5.73 to 7.01.
40 to 70	6.27 to 7.64.

(2) The maximum rotation of the midsagittal plane of the head shall be 66 to 82 degrees with respect to the pendulum's longitudinal centerline. The decaying head rotation vs. time curve shall cross the zero angle between 58 to 67 ms after reaching its peak value.

(3) The moment about the x-axis which coincides with the midsagittal plane of the head at the level of the occipital condyles shall have a maximum value between 73 and 88 Nm. The decaying moment vs. time curve shall first cross zero moment between 49 and 64 ms after reaching its peak value. The following formula is to be used to calculate the moment about the occipital condyles when using the six-axis neck transducer:

$$M = M_x + 0.01778 F_y$$

Where M_x and F_y are the moment and force measured by the transducer and expressed in terms of Nm and N, respectively.

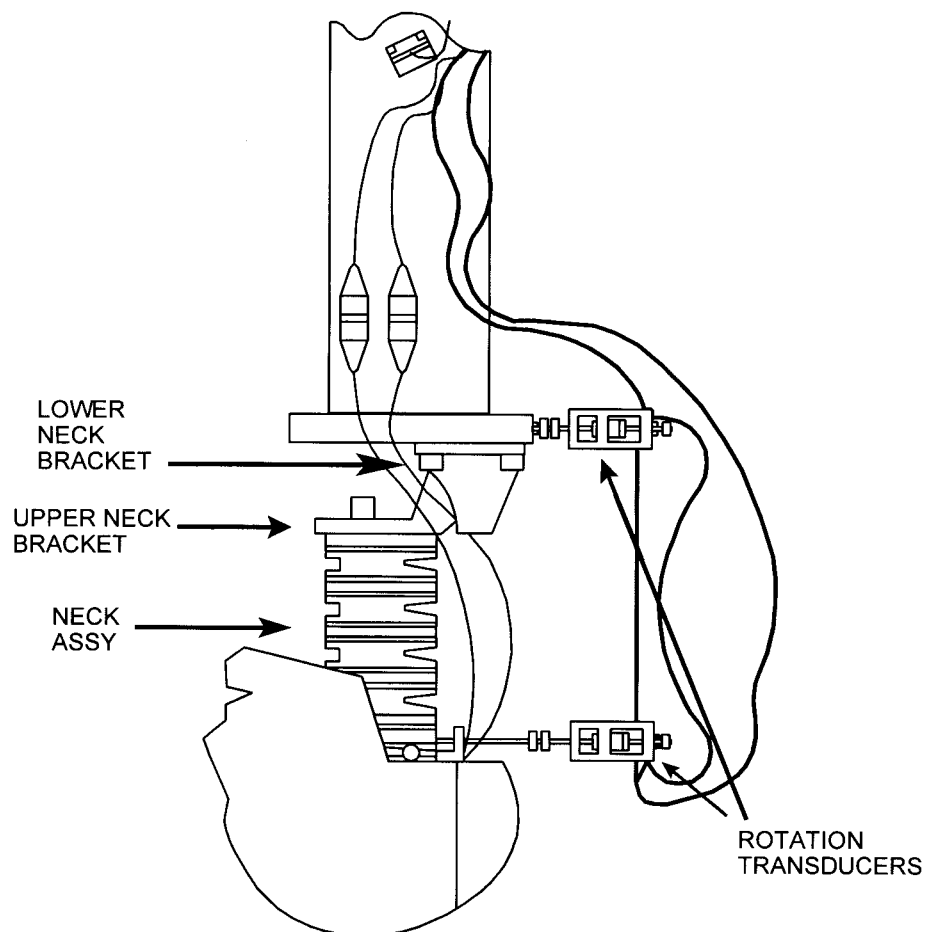
(4) The maximum rotation of the head with respect to the pendulum's longitudinal centerline shall occur between 2 and 16 ms after peak moment.

[63 FR 41470, Aug. 4, 1998, as amended at 66 FR 51882, Oct. 11, 2001]

§ 572.114 Thorax.

The specifications and test procedure for the thorax for the SID/HIII dummy are identical to those applicable to the SID dummy as set forth in § 572.42 except that the reference to the SID device found in § 572.42(a), (SA-SID-M001A revision A, dated May 18, 1994) does not apply and the reference to the SID/HIII (SA-SIDH3-M001, dated April 19, 1997) is applied in its place.

Figure 52
NECK PENDULUM TEST



§ 572.115 Lumbar spine and pelvis.

The specifications and test procedure for the lumbar spine and pelvis are identical to those for the SID dummy as set forth in §572.42 except that the reference to the SID device found in §572.42(a), (SA-SID-M001A revision A, dated May 18, 1994) does not apply and the reference to the SID/HIII (SA-

SIDH3-M001, dated April 19, 1997) is applied in its place.

§ 572.116 Instrumentation and test conditions.

(a) The test probe for lateral thoracic and pelvis impact tests are the same as those specified in §572.44(a).

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(b) Accelerometer mounting in the thorax is the same as specified in § 572.44(b).

(c) Accelerometer mounting in the pelvis is the same as specified in § 572.44(c).

(d) Head accelerometer mounting is the same as specified in § 572.36(c).

(e) Neck transducer mounting is the same as specified in § 572.36(d).

(f) Instrumentation and sensors used must conform to SAE Recommended Practice J211, March 1995, "Instrumentation for Impact Tests."

(g) The mountings for the spine, rib and pelvis accelerometers shall have no resonance frequency within a range of 3 times the frequency range of the applicable channel class.

(h) Limb joints of the test dummy shall be set at the force between 1 to 2 g's, which just supports the limb's weight when the limbs are extended horizontally forward. The force required to move a limb segment does not exceed 2 g's throughout the range of the limb motion.

(i) Performance tests must be conducted at a temperature between 20.6 and 22.2 degrees C. (69 to 72 degrees F.) and at a relative humidity between 10 percent and 70 percent after exposure of the dummy to those conditions for a period of at least four (4) hours.

(j) For the performance of tests specified in § 572.114 and § 572.115, the dummy is positioned the same as specified in § 572.44(h).

Subpart N—Six-year-old Child Test Dummy, Beta Version

SOURCE: 65 FR 2065, Jan. 13, 2000, unless otherwise noted.

§ 572.120 Incorporation by reference.

(a) The following materials are hereby incorporated into this subpart by reference:

(1) A drawings and inspection package entitled "Parts List and Drawings, Hybrid III Six-year-old Child Test Dummy (H-III6C, Beta Version) (June 2002)", consisting of:

(i) Drawing No. 127-1000, 6-year H3 Head Complete,

(ii) Drawing No. 127-1015, Neck Assembly,

(iii) Drawing No. 127-2000, Upper Torso Assembly,

(iv) Drawing No. 127-3000, Lower Torso Assembly,

(v) Drawing No. 127-4000-1 and 4000-2, Leg Assembly,

(vi) Drawing No. 127-5000-1 and 5000-2, Arm Assembly, and

(vii) The Hybrid III Six-year-old Child Parts/Drawing List.

(2) A procedures manual entitled "Procedures for Assembly, Disassembly, and Inspection (PADI) of the Hybrid III 6-year-old Child Crash Test Dummy (H-III6C), Beta Version, June 2002";

(3) SAE Recommended Practice J211-1995 Instrumentation for Impact Tests—Parts 1 and 2, dated March, 1995";

(4) SAE J1733 Information Report, titled "Sign Convention for Vehicle Crash Testing", dated December 1994.

(b) The Director of the Federal Register approved those materials incorporated by reference in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies of the materials may be inspected at NHTSA's Technical Reference Library, 400 Seventh Street SW., room 5109, Washington, DC, or at the Office of the Federal Register, 800 North Capitol Street, NW., Suite 700, Washington, DC.

(c) The incorporated materials are available as follows:

(1) The drawings and specifications package and the PADI document referred to in subparagraph (a) are accessible for viewing and copying at the Department of Transportation Docket's public area, Plaza 401, 400 Seventh St., SW., Washington, DC 20590, and may be downloaded from dms.dot.gov. They are also available from Reprographic Technologies, 9107 Gaither Rd, Gaithersburg, MD 200877, (301) 419-5070.

(2) The SAE materials referred to in paragraphs (a)(3) and (a)(4) of this section are available from the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.

[65 FR 2065, Jan. 13, 2000, as amended at 67 FR 47327, July 18, 2002]

§ 572.121 General description.

(a) The Hybrid III type 6-year-old dummy is defined by drawings and specifications containing the following materials:

(1) Technical drawings and specifications package P/N 127-0000, the titles of which are listed in Table A;

(2) Procedures for Assembly, Disassembly, and Inspection (PADI) of the Hybrid III 6-year-old test dummy, Alpha version (August 1999).

TABLE A

Component assembly	Drawing number
Head assembly	127-1000
Neck assembly	127-1015
Upper torso assembly	127-2000
Lower torso assembly	127-3000
Leg assembly	127-4000
Arm assembly	127-5000

(b) Adjacent segments are joined in a manner such that except for contacts existing under static conditions, there is no contact between metallic elements throughout the range of motion or under simulated crash impact conditions.

(c) The structural properties of the dummy are such that the dummy must conform to this Subpart in every respect before use in any test similar to those specified in Standard 208, "Occupant Crash Protection", and Standard 213, "Child Restraint Systems".

§ 572.122 Head assembly and test procedure.

(a) The head assembly for this test consists of the complete head (drawing 127-1000), a six-axis neck transducer (drawing SA572-S11) or its structural replacement (drawing 78051-383X), a head to neck-to-pivot pin (drawing 78051-339), and 3 accelerometers (drawing SA572-S4).

(b) When the head assembly in paragraph (a) of this section is dropped from a height of 376.0 ± 1.0 mm (14.8 ± 0.04 in) in accordance with paragraph (c) of this section, the peak resultant acceleration at the location of the accelerometers at the head CG may not be less than 245 G or more than 300 G. The resultant acceleration vs. time history curve shall be unimodal; oscillations occurring after the main pulse must be less than 10 percent of the

peak resultant acceleration. The lateral acceleration shall not exceed 15 g's (zero to peak).

(c) *Head test procedure.* The test procedure for the head is as follows:

(1) Soak the head assembly in a controlled environment at any temperature between 18.9 and 25.6 °C (66 and 78 °F) and a relative humidity from 10 to 70 percent for at least four hours prior to a test.

(2) Prior to the test, clean the impact surface of the skin and the impact plate surface with isopropyl alcohol, trichloroethane, or an equivalent. The skin of the head must be clean and dry for testing.

(3) Suspend the head assembly as shown in Figure N1. The lowest point on the forehead must be 376.0 ± 1.0 mm (14.8 ± 0.04 in) from the impact surface and the head must be oriented to an incline of 62 ± 1 deg. between the "D" plane as shown in Figure N1 and the plane of the impact surface. The 1.57 mm (0.062 in) diameter holes located on either side of the dummy's head shall be used to ensure that the head is level with respect to the impact surface.

(4) Drop the head assembly from the specified height by means that ensure a smooth, instant release onto a rigidly supported flat horizontal steel plate which is 50.8 mm (2 in) thick and 610 mm (24 in) square. The impact surface shall be clean, dry and have a micro finish of not less than 203.2×10^{-6} mm (8 micro inches) (RMS) and not more than 2032.0×10^{-6} mm (80 micro inches) (RMS).

(5) Allow at least 2 hours between successive tests on the same head.

§ 572.123 Neck assembly and test procedure.

(a) The neck assembly for the purposes of this test consists of the assembly of components shown in drawing 127-1015.

(b) When the head-neck assembly consisting of the head (drawing 127-1000), neck (drawing 127-1015), pivot pin (drawing 78051-339), bib simulator (drawing TE127-1025, neck bracket assembly (drawing 127-8221), six-axis neck transducer (drawing SA572-S11), neck mounting adaptor (drawing TE-2208-001), and three accelerometers (drawing

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SA572–S4) installed in the head assembly as specified in § 572.122, is tested according to the test procedure in paragraph (c) of this section, it shall have the following characteristics:

(1) *Flexion.* (i) Plane D, referenced in Figure N2, shall rotate in the direction of preimpact flight with respect to the pendulum's longitudinal centerline between 74 degrees and 92 degrees. Within this specified rotation corridor, the peak moment about the occipital condyles shall be not less than 27 N-m (19.9 ft-lbf) and not more than 33 N-m (24.3 ft-lbf).

(ii) The positive moment shall decay for the first time to 5 N-m (3.7 ft-lbf) between 103 ms and 123 ms.

(iii) The moment shall be calculated by the following formula: Moment (N-m) = $M_y - (0.01778m) \times (F_x)$.

(iv) M_y is the moment about the y-axis and F_x is the shear force measured by the neck transducer (drawing SA572–S11) and 0.01778m is the distance from force to occipital condyle.

(2) *Extension.* (i) Plane D, referenced in Figure N3, shall rotate in the direction of preimpact flight with respect to the pendulum's longitudinal centerline between 85 degrees and 103 degrees. Within this specified rotation corridor, the peak moment about the occipital condyles shall be not more than –19 N-m (–14 ft-lbf) and not less than –24 N-m (–17.7ft-lbf).

(ii) The negative moment shall decay for the first time to –5 N-m (–3.7 ft-lbf) between 123 ms and 147 ms.

(iii) The moment shall be calculated by the following formula: Moment (N-m) = $M_y - (0.01778m) \times (F_x)$.

(iv) M_y is the moment about the y-axis and F_x is the shear force measured by the neck transducer (drawing

SA572–S11) and 0.017778m is the distance from force to occipital condyle.

(3) Time-zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material.

(c) *Test procedure.* The test procedure for the neck assembly is as follows:

(1) Soak the neck assembly in a controlled environment at any temperature between 20.6 and 22.2 °C (69 and 72 °F) and a relative humidity between 10 and 70 percent for at least four hours prior to a test.

(2) Torque the jam nut (drawing 9000341) on the neck cable (drawing 127–1016) to 0.23 ±0.02 N-m (2.0 ±0.2 in-lbs).

(3) Mount the head-neck assembly, defined in paragraph (b) of this section, on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum as shown in Figure N2 for flexion tests and Figure N3 for extension tests.

(4) Release the pendulum and allow it to fall freely from a height to achieve an impact velocity of 4.95 ±0.12 m/s (16.2 ±0.4 ft/s) for flexion tests and 4.3 ±0.12 m/s (14.10 ±0.40 ft/s) for extension tests, measured by an accelerometer mounted on the pendulum as shown in Figure 22 of 49 CFR 572 at the instant of contact with the honey comb.

(i) Time-zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. All data channels should be at the zero level at this time.

(ii) Stop the pendulum from the initial velocity with an acceleration vs. time pulse which meets the velocity change as specified below. Integrate the pendulum acceleration data channel to obtain the velocity vs. time curve:

TABLE B

Time	Pendulum pulse			
	Flexion		Extension	
	m/s	ft/s	m/s	ft/s
10	1.2–1.6	3.9–5.3	1.0–1.4	3.3–4.6
20	2.4–3.4	7.9–11.2	2.2–3.0	7.2–9.8
30	3.8–5.0	12.5–16.4	3.2–4.2	10.5–13.8

§ 572.124 Thorax assembly and test procedure.

(a) *Thorax (upper torso) assembly.* The thorax consists of the part of the torso assembly shown in drawing 127-2000.

(b) When the anterior surface of the thorax of a completely assembled dummy (drawing 127-0000) is impacted by a test probe conforming to section 572.127(a) at 6.71 ± 0.12 m/s (22.0 ± 0.4 ft/s) according to the test procedure in paragraph (c) of this section:

(1) The maximum sternum displacement (compression) relative to the spine, measured with chest deflection transducer (drawing SA572-S50), must be not less than 38.0 mm (1.50 in) and not more than 46.0 mm (1.80 in). Within this specified compression corridor, the peak force, measured by the probe in accordance with section 572.127, shall not be less than 1150 N (259 lbf) and not more than 1380 N (310 lbf). The peak force after 12.5 mm (0.5 in) of sternum displacement but before reaching the minimum required 38.0 mm (1.5 in) sternum displacement limit shall not exceed 1500 N (337.2 lbf).

(2) The internal hysteresis of the ribcage in each impact as determined by the plot of force vs. deflection in paragraph (b)(1) of this section shall be not less than 65 percent but not more than 85 percent.

(c) *Test procedure.* The test procedure for the thorax assembly is as follows:

(1) Soak the dummy in a controlled environment at any temperature between 20.6° and 22.2 °C (69° and 72 °F) and a relative humidity between 10 and 70 percent for at least four hours prior to a test.

(2) Seat and orient the dummy, wearing tight-fitting underwear or equivalent consisting of a size 5 short-sleeved shirt having a weight less than 0.090 kg (0.2 lb) and an opening at the top just large enough to permit the passage of the head with a tight fit, and a size 4 pair of long pants having a weight of less than 0.090 kg (0.2 lb) with the legs cut off sufficiently above the knee to allow the knee target to be visible, on a seating surface without back support as shown in Figure N4, with the limbs extended horizontally and forward, parallel to the midsagittal plane, the midsagittal plane vertical within ± 1 degree and the ribs level in the anterior-

posterior and lateral directions within ± 0.5 degrees.

(3) Establish the impact point at the chest midsagittal plane so that the impact point of the longitudinal centerline of the probe coincides with the midsagittal plane of the dummy within ± 2.5 mm (0.1 in) and is 12.7 ± 1.1 mm (0.5 ± 0.04 in) below the horizontal-peripheral centerline of the No. 3 rib and is within 0.5 degrees of a horizontal line in the dummy's midsagittal plane.

(4) Impact the thorax with the test probe so that at the moment of contact the probe's longitudinal center line falls within 2 degrees of a horizontal line in the dummy's midsagittal plane.

(5) Guide the test probe during impact so that there is no significant lateral, vertical or rotational movement.

(6) No suspension hardware, suspension cables, or any other attachments to the probe, including the velocity vane, shall make contact with the dummy during the test.

[65 FR 2065, Jan. 13, 2000, as amended at 67 FR 47327, July 18, 2002]

§ 572.125 Upper and lower torso assemblies and torso flexion test procedure.

(a) *Upper/lower torso assembly.* The test objective is to determine the stiffness effects of the lumbar spine (drawing 127-3002), including cable (drawing 127-8095), mounting plate insert (drawing 910420-048), nylon shoulder bushing (drawing 9001373), nut (drawing 9001336), and abdominal insert (drawing 127-8210), on resistance to articulation between upper torso assembly (drawing 127-2000) and lower torso assembly (drawing 127-3000).

(b)(1) When the upper torso assembly of a seated dummy is subjected to a force continuously applied at the head to neck pivot pin level through a rigidly attached adaptor bracket as shown in Figure N5 according to the test procedure set out in paragraph (c) of this section, the lumbar spine-abdomen assembly shall flex by an amount that permits the upper torso assembly to translate in angular motion until the machined rear surface of the instrument cavity at the back of the thoracic spine box is at 45 ± 0.5 degrees relative to the vertical transverse plane, at which time the force applied as shown

§ 572.126

in Figure N5 must be not less than 147 N (33 lbf) and not more than 200 N (45 lbf), and

(2) Upon removal of the force, the torso assembly must return to within 8 degrees of its initial position.

(c) *Test procedure.* The test procedure for the torso assemblies is as follows:

(1) Soak the dummy in a controlled environment at any temperature between 18.9 and 25.6 °C (66 and 78 °F) and a relative humidity between 10 and 70 percent for at least four hours prior to a test.

(2) Attach the dummy (with or without the legs below the femurs) to the fixture in a seated posture as shown in Figure N5.

(3) Secure the pelvis at the pelvis instrument cavity rear face by threading four ¼ in cap screws into the available threaded attachment holes. Tighten the mountings so that the test material is rigidly affixed to the test fixture and the pelvic-lumbar joining surface is horizontal.

(4) Flex the thorax forward three times between vertical and until the torso reference plane, as shown in figure N5, reaches 30 ±2 degrees from vertical. Bring the torso to vertical orientation, remove all externally applied flexion forces, and wait 30 minutes before conducting the test. During the 30-minute waiting period, the dummy's upper torso shall be externally supported at or near its vertical orientation to prevent sagging.

(5) Remove the external support and wait two minutes. Measure the initial orientation of the torso reference plane of the seated, unsupported dummy as shown in Figure N5. This initial torso orientation angle may not exceed 22 degrees.

(6) Attach the loading adapter bracket to the spine of the dummy, the pull cable, and the load cell as shown in Figure N5.

(7) Apply a tension force in the midsagittal plane to the pull cable as shown in Figure N5 at any upper torso deflection rate between 0.5 and 1.5 degrees per second, until the torso reference plane is at 45 ±0.5 degrees of flexion relative to the vertical transverse plane as shown in Figure N5.

(8) Continue to apply a force sufficient to maintain 45 ±0.5 degrees of

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flexion for 10 seconds, and record the highest applied force during the 10-second period.

(9) Release all force as rapidly as possible, and measure the return angle at 3 minutes or any time thereafter after the release.

§ 572.126 Knees and knee impact test procedure.

(a) *Knee assembly.* The knee assembly is part of the leg assembly (drawing 127-4000-1 and -2).

(b) When the knee assembly, consisting of knee machined (drawing 127-4013), knee flesh (drawing 127-4011), lower leg (drawing 127-4014), the foot assembly (drawing 127-4030-1(left) and -2 (right)) and femur load transducer (drawing SA572-S10) or its structural replacement (drawing 127-4007) is tested according to the test procedure in section 572.127(c), the peak resistance force as measured with the test probe mounted accelerometer must be not less than 2.0 kN (450 lbf) and not more than 3.0 kN (674 lbf).

(c) *Test procedure.* The test procedure for the knee assembly is as follows:

(1) Soak the knee assembly in a controlled environment at any temperature between 18.9 and 25.6 °C (66 and 78 °F) and a relative humidity from 10 to 70 percent for at least four hours prior to a test.

(2) Mount the test material and secure it to a rigid test fixture as shown in Figure N6. No contact is permitted between any part of the foot or tibia and any exterior surface.

(3) Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur.

(4) Guide the pendulum so that there is no significant lateral vertical or rotational movement at time-zero.

(5) The test probe velocity at the time of contact shall be 2.1 ±0.03 m/s (6.9 ± 0.1 ft/s).

(6) No suspension hardware, suspension cables, or any other attachments to the probe, including the velocity vane, shall make contact with the dummy during testing.

[65 FR 2065, Jan. 13, 2000, as amended at 67 FR 47328, July 18, 2002]

§572.127 Test conditions and instrumentation.

(a) The test probe for thoracic impacts, except for attachments, shall be of rigid metal or metal alloy construction and concentric about its longitudinal axis. Any attachments to the impactor, such as suspension hardware, velocity vanes, etc., must meet the requirements of §572.124(c)(6). The impactor shall have a mass of 2.86 ± 0.02 kg (6.3 ± 0.05 lb) and a minimum mass moment of inertia of 160 kg-c^2 ($0.141 \text{ lb-in-sec}^2$) in yaw and pitch about the CG of the probe. One third of the weight of suspension cables and any attachments to the impact probe must be included in the calculation of mass, and such components may not exceed five percent of the total weight of the probe. The impacting end of the probe, has a flat, continuous, and non-deformable 101.6 ± 0.25 mm (4.00 ± 0.01 in) diameter face with an edge radius of $7.6/12.7$ mm ($0.3/0.5$ in). The impactor shall have a $101\text{--}103$ mm ($4.0\text{--}4.1$ in) diameter cylindrical surface extending for a minimum of 12.5 mm (0.5 in) to the rear from the impact face. The probe's end opposite to the impact face has provisions for mounting an accelerometer with its sensitive axis collinear with the longitudinal axis of the probe. The impact probe shall have a free air resonant frequency of not less than 1000 Hz limited to the direction of the longitudinal axis of the impactor.

(b) The test probe for knee impacts, except for attachments, shall be of rigid metal or alloy construction and concentric about its longitudinal axis. Any attachments to the impactor, such as suspension hardware, velocity vanes, etc., must meet the requirements of §572.126(c)(6). The impactor shall have a mass of 0.82 ± 0.02 kg (1.8 ± 0.05 lb) and a minimum mass moment of inertia of 34 kg-cm^2 (0.03 lb-in-sec^2) in yaw and pitch about the CG of the probe. One third of the weight of suspension cables and any attachments to the impact probe must be included in the calculation of mass, and such components may not exceed five percent of the total weight of the probe. The impacting end of the probe, has a flat, continuous, and non-deformable 76.2 ± 0.2 mm (3.00 ± 0.01 in) diameter face with an edge radius of $7.6/12.7$ mm ($0.3/0.5$ in).

The impactor shall have a $76\text{--}77$ mm ($3.0\text{--}3.1$ in) diameter cylindrical surface extending for a minimum of 12.5 mm (0.5 in) to the rear from the impact face. The probe's end opposite to the impact face has provisions for mounting an accelerometer with its sensitive axis collinear with the longitudinal axis of the probe. The impact probe shall have a free air resonant frequency of not less than 1000 Hz limited to the direction of the longitudinal axis of the impactor.

(c) Head accelerometers shall have dimensions, response characteristics, and sensitive mass locations specified in drawing SA572-S4 and be mounted in the head as shown in drawing 127-0000 sheet 3.

(d) *Neck force/moment transducer.* (1) The upper neck force/moment transducer shall have the dimensions, response characteristics, and sensitive axis locations specified in drawing SA572-S11 and be mounted in the head-neck assembly as shown in drawing 127-0000 sheet 3.

(2) The optional lower neck force/moment transducer shall have the dimensions, response characteristics, and sensitive axis locations specified in drawing SA572-S26 and be mounted as shown in drawing 127-0000 sheet 3.

(e) The thorax accelerometers shall have the dimensions, response characteristics, and sensitive mass locations specified in drawing SA572-S4 and be mounted in the torso assembly in tri-axial configuration at T4, and as optional instrumentation in uniaxial forward-aft oriented configuration on the most anterior ends of ribs #1 and #6 and at the spine box at the levels of #1 and #6 ribs as shown in 127-0000 sheet 3.

(f) The chest deflection transducer shall have the dimensions and response characteristics specified in drawing SA572-S50 and be mounted in the upper torso assembly as shown in 127-0000 sheet 3.

(g) The optional lumbar spine force-moment transducer shall have the dimensions, response characteristics, and sensitive axis locations specified in drawing SA572-S12 and be mounted in the lower torso assembly as shown in drawing 127-0000 sheet 3 as a replacement for lumbar adaptor 127-3005.

(h) The optional iliac spine force transducers shall have the dimensions and response characteristics specified in drawing SA572-S13 and be mounted in the torso assembly as shown in drawing 127-0000 sheet 3 as a replacement for ASIS load cell 127-3015-1 (left) and -2 (right).

(i) The optional pelvis accelerometers shall have the dimensions, response characteristics, and sensitive mass locations specified in drawing SA572-S4 and be mounted in the torso assembly in triaxial configuration in the pelvis bone as shown in drawing 127-0000 sheet 3.

(j) The femur force transducer shall have the dimensions and response characteristics specified in drawing SA72-S10 and be mounted in the leg assembly as shown in drawing 127-0000 sheet 3.

(k) The outputs of acceleration and force-sensing devices installed in the dummy and in the test apparatus specified by this part must be recorded in individual data channels that conform to SAE Recommended Practice J211, Rev. Mar95 "Instrumentation for Impact Tests," except that the lumbar measurements are based on CFC 600, with channel classes as follows:

- (1) Head acceleration—Class 1000.
- (2) Neck:
 - (i) Forces—Class 1000;
 - (ii) Moments—Class 600;
 - (iii) Pendulum acceleration—Class 180;
 - (iv) Rotation—Class 60 (if used).
- (3) Thorax:

- (i) Rib acceleration—Class 1000;
- (ii) Spine and pendulum accelerations—Class 180;
- (iii) Sternum deflection —Class 600.
- (4) Lumbar:
 - (i) Forces—Class 1000;
 - (ii) Moments —Class 600;
 - (iii) Flexion —Class 60 if data channel is used.

- (5) Pelvis accelerations —Class 1000.
- (6) Femur forces—Class 600.

(l) Coordinate signs for instrumentation polarity shall conform to the Sign Convention For Vehicle Crash Testing, Surface Vehicle Information Report, SAE J1733, 1994-12.

(m) The mountings for sensing devices shall have no resonance frequency less than 3 times the frequency range of the applicable channel class.

(n) Limb joints must be set at one G, barely restraining the weight of the limb when it is extended horizontally. The force needed to move a limb segment shall not exceed 2G throughout the range of limb motion.

(o) Performance tests of the same component, segment, assembly, or fully assembled dummy shall be separated in time by period of not less than 30 minutes unless otherwise noted.

(p) Surfaces of dummy components may not be painted except as specified in this subpart or in drawings subtended by this subpart.

[65 FR 2065, Jan. 13, 2000, as amended at 67 FR 47328, July 18, 2002]

FIGURES TO SUBPART N

Figure N 1
HEAD DROP TEST SET-UP SPECIFICATIONS

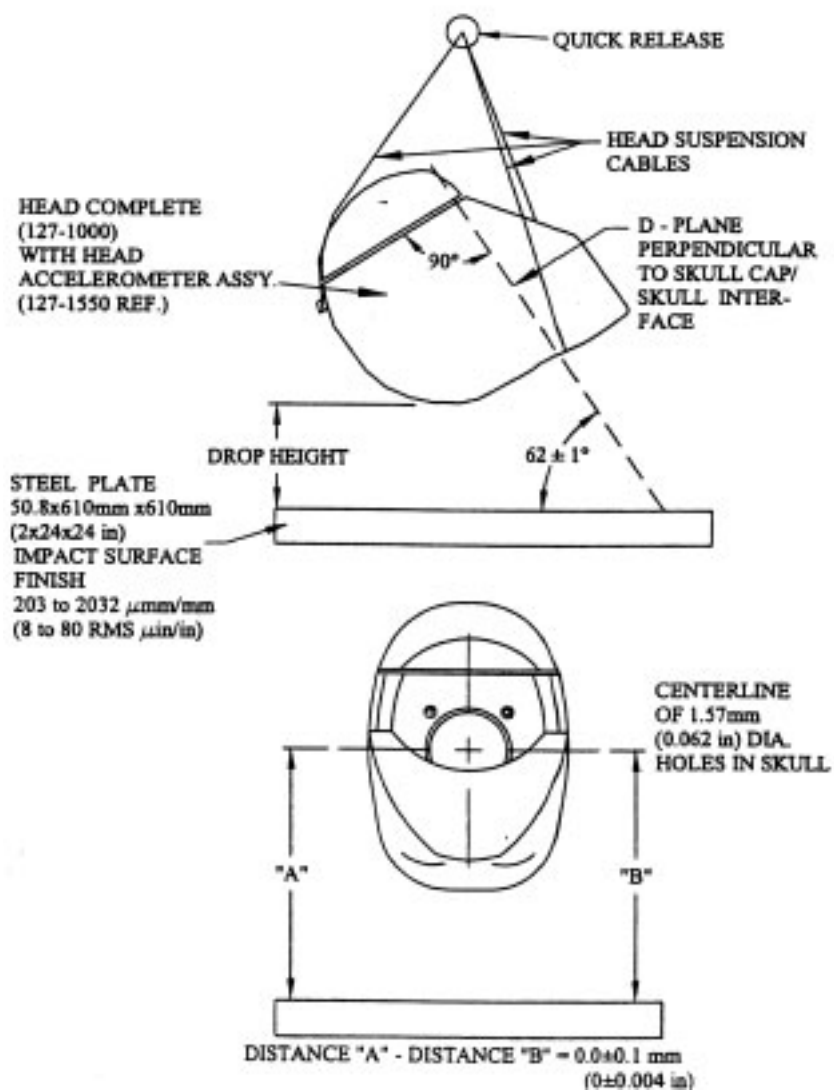


Figure N 2

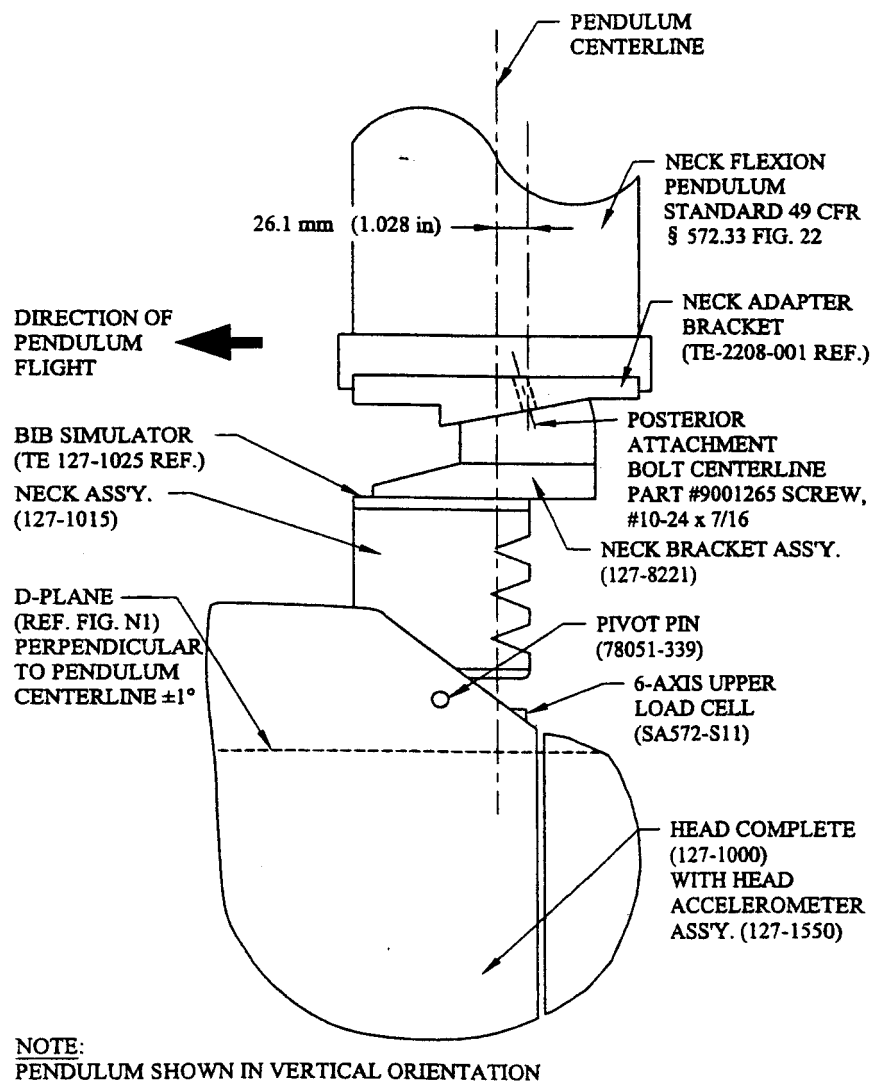
NECK FLEXION TEST SET-UP SPECIFICATIONS

Figure N3

NECK EXTENSION TEST SET-UP SPECIFICATIONS

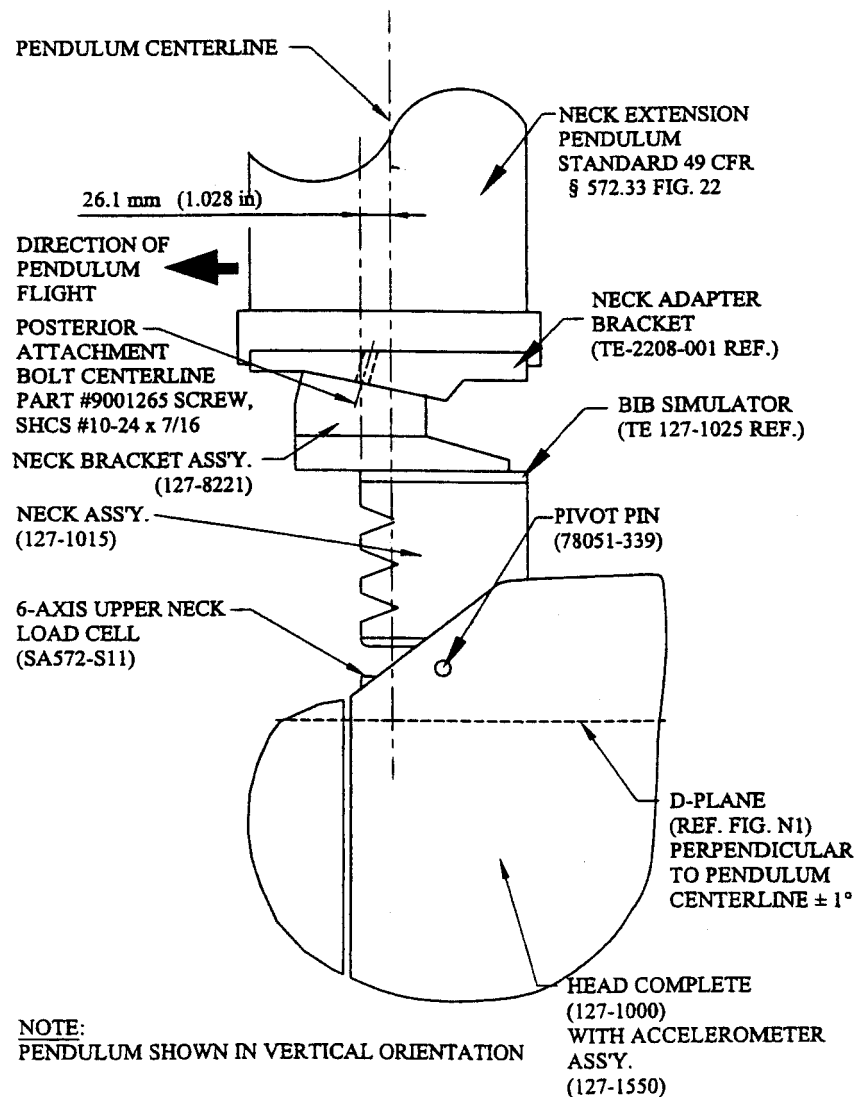
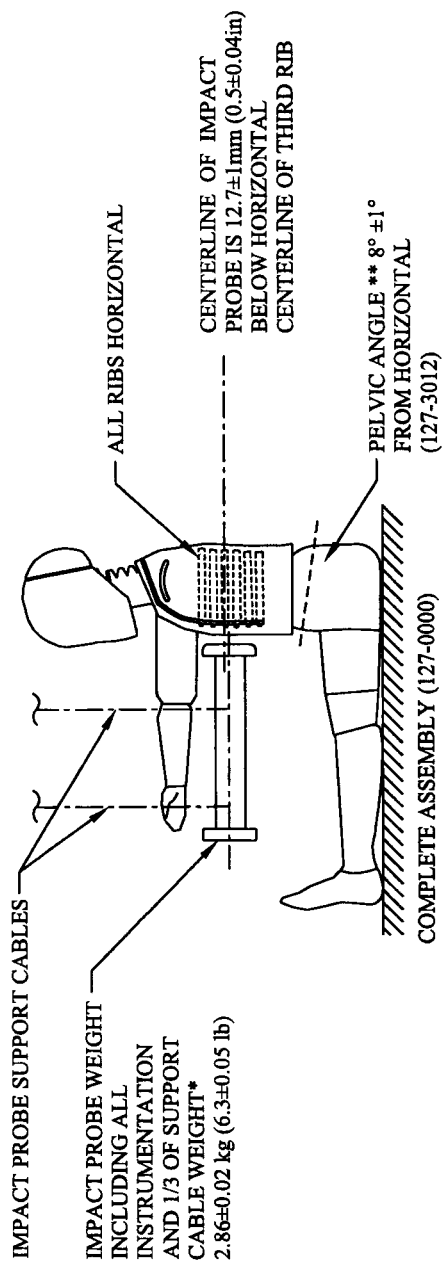


FIGURE N 4
THORAX IMPACT TEST SET-UP SPECIFICATIONS



* 1/3 CABLE WEIGHT NOT TO EXCEED 5% OF THE TOTAL IMPACT PROBE WEIGHT

** PELVIS LUMBAR JOINING SURFACE

FIGURE N 5
TORSO FLEXION TEST SET-UP SPECIFICATIONS

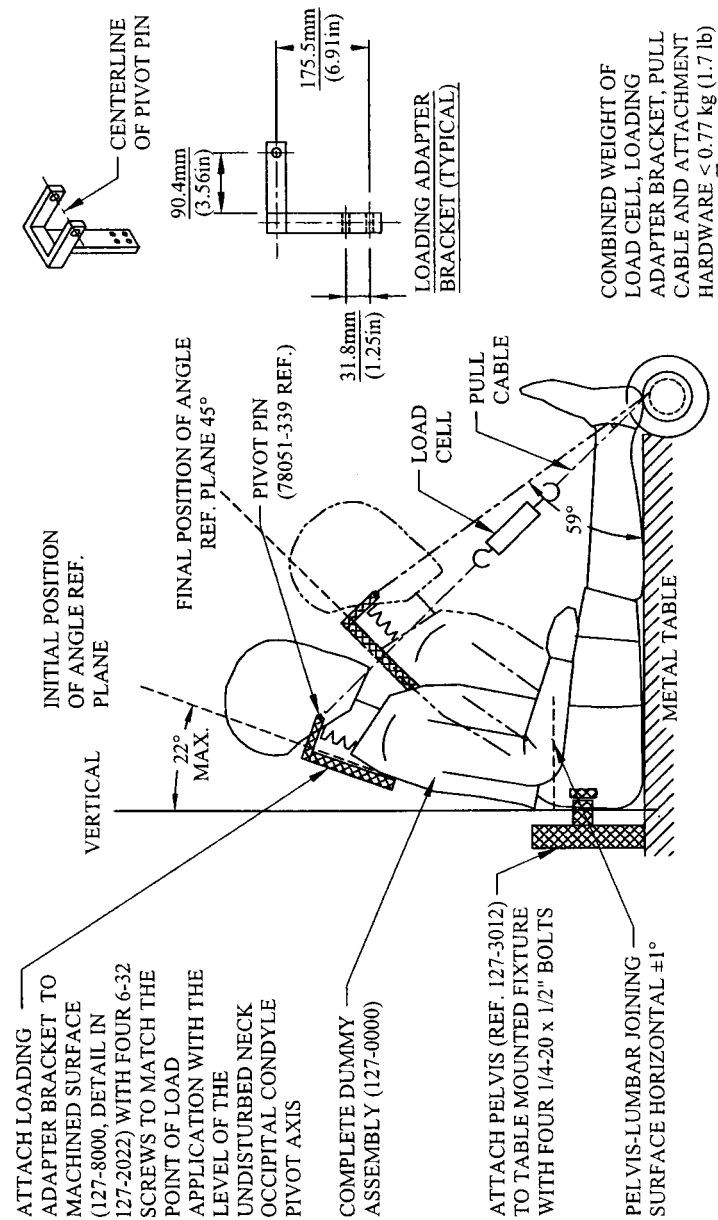
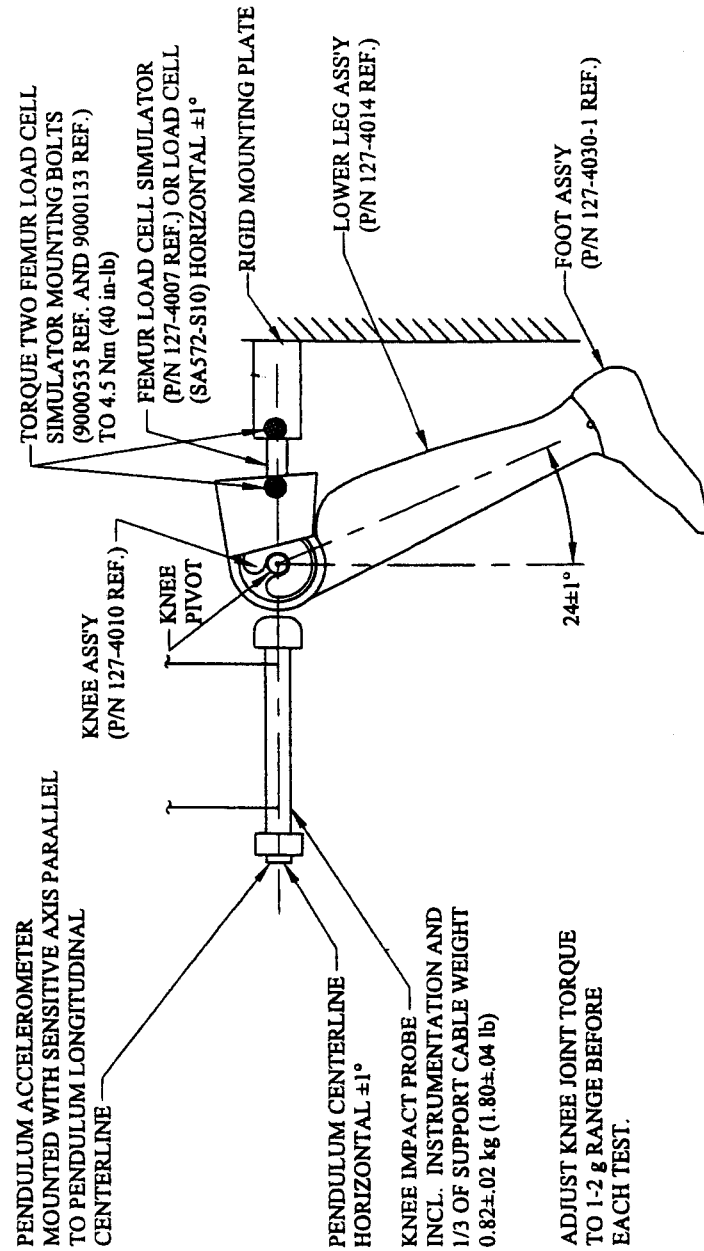


FIGURE N 6
KNEE IMPACT TEST SET-UP SPECIFICATIONS



[65 FR 2065, Jan. 13, 2000, as amended at 67 FR 47329, July 18, 2002; 67 FR 59023, Sept. 19, 2002]

Subpart O—Hybrid III 5th Percentile Female Test Dummy, Alpha Version

SOURCE: 65 FR 10968, Mar. 1, 2000, unless otherwise noted.

§ 572.130 Incorporation by reference.

(a) The following materials are hereby incorporated into this Subpart by reference:

(1) A drawings and specification package entitled "Parts List and Drawings, Part 572 Subpart O Hybrid III Fifth Percentile Small Adult Female Crash Test Dummy (HIII-5F, Alpha Version)" (June 2002), incorporated by reference in §§ 572.131, and consisting of:

(i) Drawing No. 880105-100X, Head Assembly, incorporated by reference in §§ 572.131, 572.132, 572.133, 572.134, 572.135, and 572.137;

(ii) Drawing No. 880105-250, Neck Assembly, incorporated by reference in §§ 572.131, 572.133, 572.134, 572.135, and 572.137;

(iii) Drawing No. 880105-300, Upper Torso Assembly, incorporated by reference in §§ 572.131, 572.134, 572.135, and 572.137;

(iv) Drawing No. 880105-450, Lower Torso Assembly, incorporated by reference in §§ 572.131, 572.134, 572.135, and 572.137;

(v) Drawing No. 880105-560-1, Complete Leg Assembly—left, incorporated by reference in §§ 572.131, 572.135, 572.136, and 572.137;

(vi) Drawing No. 880105-560-2, Complete Leg Assembly—right incorporated by reference in §§ 572.131, 572.135, 572.136, and 572.137;

(vii) Drawing No. 880105-728-1, Complete Arm Assembly—left, incorporated by reference in §§ 572.131, 572.134, and 572.135 as part of the complete dummy assembly;

(viii) Drawing No. 880105-728-2, Complete Arm Assembly—right, incorporated by reference in §§ 572.131, 572.134, and 572.135 as part of the complete dummy assembly;

(ix) The Hybrid III 5th percentile small adult female crash test dummy

parts list, incorporated by reference in § 572.131;

(2) A procedures manual entitled "Procedures for Assembly, Disassembly, and Inspection (PADI) Subpart O Hybrid III Fifth Percentile Adult Female Crash Test Dummy (HIII-5F), Alpha Version" (February 2002), incorporated by reference in § 572.132.

(3) SAE Recommended Practice J211/1, Rev. Mar 95 "Instrumentation for Impact Tests—Part 1—Electronic Instrumentation", incorporated by reference in § 572.137;

(4) SAE Recommended Practice J211/2, Rev. Mar 95 "Instrumentation for Impact Tests—Part 2—Photographic Instrumentation" incorporated by reference in § 572.137; and

(5) SAE J1733 of 1994-12 "Sign Convention for Vehicle Crash Testing", incorporated by reference in § 572.137.

(b) The Director of the Federal Register approved the materials incorporated by reference in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies of the materials may be inspected at NHTSA's Technical Reference Library, 400 Seventh Street SW., room 5109, Washington, DC, or at the Office of the Federal Register, 800 North Capitol Street, NW., Suite 700, Washington, DC.

(c) The incorporated materials are available as follows:

(1) The Parts List and Drawings, Part 572 Subpart O Hybrid III Fifth Percentile Small Adult Female Crash Test Dummy, (HIII-5F, Alpha Version) (June 2002), referred to in paragraph (a)(1) of this section and the Procedures for Assembly, Disassembly, and Inspection (PADI) of the Hybrid III 5th Percentile Small Adult Female Crash Test Dummy, Alpha Version, referred to in paragraph (a)(2) of this section are available from Reprographic Technologies, 9107 Gaither Road, Gaithersburg, MD 20877, (301) 419-5070. These documents are also accessible for reading and copying through the DOT Docket Management System.

(2) The SAE materials referred to in paragraphs (a)(3) and (a)(4) of this section are available from the Society of

§ 572.131

Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, Pa. 15096.

[65 FR 10968, Mar. 1, 2000, as amended at 67 FR 46413, July 15, 2002]

§ 572.131 General description.

(a) The Hybrid III fifth percentile adult female crash test dummy is defined by drawings and specifications containing the following materials:

(1) Technical drawings and specifications package P/N 880105-000 (refer to § 572.130(a)(1)), the titles of which are listed in Table A;

(2) Parts List and Drawings, Part 572 Subpart O Hybrid III Fifth Percentile Small Adult Female Crash Test Dummy (HIII-5F, Alpha Version) (June 2002) (refer to § 572.130(a)(1)(ix)).

TABLE A

Component assembly	Drawing No.
Head Assembly	880105-100X
Neck Assembly	880105-250
Upper Torso Assembly	880105-300
Lower Torso Assembly	880105-450
Complete Leg Assembly—left	880105-560-1
Complete Leg Assembly—right	880105-560-2
Complete Arm Assembly—left	880105-728-1
Complete Arm Assembly—right	880105-728-2

(b) Adjacent segments are joined in a manner such that, except for contacts existing under static conditions, there is no contact between metallic elements throughout the range of motion or under simulated crash impact conditions.

(c) The structural properties of the dummy are such that the dummy conforms to this Subpart in every respect before use in any test similar to those specified in Standard 208, Occupant Crash Protection.

[65 FR 10968, Mar. 1, 2000, as amended at 67 FR 46414, July 15, 2002]

§ 572.132 Head assembly and test procedure.

(a) The head assembly (refer to § 572.130(a)(1)(i)) for this test consists of the complete head (drawing 880105-100X), a six-axis neck transducer (drawing SA572-S11) or its structural replacement (drawing 78051-383X), and 3 accelerometers (drawing SA572-S4).

(b) When the head assembly is dropped from a height of 376.0 ± 1.0 mm

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(14.8 ± 0.04 in) in accordance with subsection (c) of this section, the peak resultant acceleration at the location of the accelerometers at the head CG may not be less than 250 G or more than 300 G. The resultant acceleration vs. time history curve shall be unimodal; oscillations occurring after the main pulse must be less than 10 percent of the peak resultant acceleration. The lateral acceleration shall not exceed 15 G (zero to peak).

(c) *Head test procedure.* The test procedure for the head is as follows:

(1) Soak the head assembly in a controlled environment at any temperature between 18.9 and 25.6 °C (66 and 78 °F) and a relative humidity from 10 to 70 percent for at least four hours prior to a test.

(2) Prior to the test, clean the impact surface of the skin and the impact plate surface with isopropyl alcohol, trichloroethane, or an equivalent. The skin of the head must be clean and dry for testing.

(3) Suspend and orient the head assembly as shown in Figure 19 of 49 CFR 572. The lowest point on the forehead must be 376.0 ± 1.0 mm (14.8 ± 0.04 in) from the impact surface. The 1.57 mm (0.062 in) diameter holes located on either side of the dummy's head shall be used to ensure that the head is level with respect to the impact surface.

(4) Drop the head assembly from the specified height by means that ensure a smooth, instant release onto a rigidly supported flat horizontal steel plate which is 50.8 mm (2.0 in) thick and 610 mm (24.0 in) square. The impact surface shall be clean, dry and have a micro finish of not less than 203.2×10^{-6} mm (8 micro inches) (RMS) and not more than 2032.0×10^{-6} mm (80 micro inches) (RMS).

(5) Allow at least 2 hours between successive tests on the same head.

§ 572.133 Neck assembly and test procedure.

(a) The neck assembly (refer to § 572.130(a)(1)(ii)) for the purposes of this test consists of the assembly of components shown in drawing 880105-250.

(b) When the head-neck assembly consisting of the head (drawing 880105-100X), neck (drawing 880105-250), bib

simulator (drawing 880105-371), upper neck adjusting bracket (drawing 880105-207), lower neck adjusting bracket (drawing 880105-208), six-axis neck transducer (drawing SA572-S11), and either three accelerometers (drawing SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X, is tested according to the test procedure in subsection (c) of this section, it shall have the following characteristics:

(1) *Flexion.* (i) Plane D, referenced in Figure O1, shall rotate in the direction of preimpact flight with respect to the pendulum's longitudinal centerline between 77 degrees and 91 degrees. During the time interval while the rotation is within the specified corridor, the peak moment, measured by the neck transducer (drawing SA5572-311), about the occipital condyles may not be less than 69 N-m (51 ft-lbf) and not more than 83 N-m (61 ft-lbf). The positive moment shall decay for the first time to 10 N-m (7.4 ft-lbf) between 80 ms and 100 ms after time zero.

(ii) The moment shall be calculated by the following formula: $\text{Moment (N-m)} = M_y - (0.01778m) \times (F_x)$.

(iii) M_y is the moment about the y-axis, F_x is the shear force measured by the neck transducer (drawing SA572-S11), and 0.01778m is the distance from force to occipital condyle.

(2) *Extension.* (i) Plane D, referenced in Figure O2, shall rotate in the direction of preimpact flight with respect to the pendulum's longitudinal centerline between 99 degrees and 114 degrees. During the time interval while the rotation is within the specified corridor, the peak moment, measured by the neck transducer (drawing SA5572-S11), about the occipital condyles shall be not more than -53 N-m (-39 ft-lbf) and not less than -65 N-m (-48 ft-lbf). The negative moment shall decay for the first time to -10 N-m (-7.4 ft-lbf) between 94 ms and 114 ms after time zero.

(ii) The moment shall be calculated by the following formula: $\text{Moment (N-m)} = M_y - (0.01778m) \times (F_x)$.

(iii) M_y is the moment about the y-axis, F_x is the shear force measured by the neck transducer (drawing SA572-S11), and 0.01778 m is the distance from force to occipital condyle.

(3) Time-zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. All data channels shall be at the zero level at this time.

(c) *Test Procedure.* The test procedure for the neck assembly is as follows:

(1) Soak the neck assembly in a controlled environment at any temperature between 20.6 and 22.2 °C (69 and 72 °F) and a relative humidity between 10 and 70 percent for at least four hours prior to a test.

(2) Torque the jam nut (drawing 9000018) on the neck cable (drawing 880105-206) to 1.4 ±0.2 N-m (12.0 ±2.0 in-lb).

(3) Mount the head-neck assembly, defined in subsection (b) of this section, on the pendulum described in Figure 22 of 49 CFR 572 so that the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum as shown in Figure O1 for flexion tests and Figure O2 for extension tests.

(4)(i) Release the pendulum and allow it to fall freely from a height to achieve an impact velocity of 7.01 ±0.12 m/s (23.0 ±0.4 ft/s) for flexion tests and 6.07 ±0.12 m/s (19.9 ±0.40 ft/s) for extension tests, measured by an accelerometer mounted on the pendulum as shown in Figure 22 of 49 CFR 572 at the instant of contact with the honeycomb.

(ii) Stop the pendulum from the initial velocity with an acceleration vs. time pulse which meets the velocity change as specified below. Integrate the pendulum acceleration data channel to obtain the velocity vs. time curve:

TABLE B—PENDULUM PULSE

Time ms	Flexion		Extension	
	m/s	ft/s	m/s	ft/s
10	2.1–2.5	6.9–8.2	1.5–1.9	4.9–6.2
20	4.0–5.0	13.1–16.4	3.1–3.9	10.2–12.8
30	5.8–7.0	19.5–23.0	4.6–5.6	15.1–18.4

§ 572.134

[65 FR 10968, Mar. 1, 2000, as amended at 67 FR 46414, July 15, 2002]

§ 572.134 Thorax assembly and test procedure.

(a) Thorax (Upper Torso) Assembly (refer to § 572.130(a)(1)(iii)). The thorax consists of the part of the torso assembly shown in drawing 880105-300.

(b) When the anterior surface of the thorax of a completely assembled dummy (drawing 880105-000) is impacted by a test probe conforming to section 572.137(a) at 6.71 ± 0.12 m/s (22.0 ± 0.4 ft/s) according to the test procedure in subsection (c) of this section:

(1) Maximum sternum displacement (compression) relative to the spine, measured with chest deflection transducer (drawing SA572-S5), must be not less than 50.0 mm (1.97 in) and not more than 58.0 mm (2.30 in). Within this specified compression corridor, the peak force, measured by the impact probe as defined in section 572.137 and calculated in accordance with paragraph (b)(3) of this section, shall not be less than 3900 N (876 lbf) and not more than 4400 N (989 lbf). The peak force after 18.0 mm (0.71 in) of sternum displacement but before reaching the minimum required 50.0 mm (1.97 in) sternum displacement limit shall not exceed 4600 N.

(2) The internal hysteresis of the ribcage in each impact as determined by the plot of force vs. deflection in paragraph (1) of this section shall be not less than 69 percent but not more than 85 percent. The hysteresis shall be calculated by determining the ratio of the area between the loading and unloading portions of the force deflection curve to the area under the loading portion of the curve.

(3) The force shall be calculated by the product of the impactor mass and its deceleration.

(c) *Test procedure.* The test procedure for the thorax assembly is as follows:

(1) The dummy is clothed in a form fitting cotton stretch above-the-elbow sleeved shirt and above-the-knee pants. The weight of the shirt and pants shall not exceed 0.14 kg (0.30 lb) each.

(2) Soak the dummy in a controlled environment at any temperature between 20.6 and 22.2 °C (69 and 72 °F) and a relative humidity between 10 and 70

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percent for at least four hours prior to a test.

(3) Seat and orient the dummy on a seating surface without back support as shown in Figure O3, with the limbs extended horizontally and forward, parallel to the midsagittal plane, the midsagittal plane vertical within ± 1 degree and the ribs level in the anterior-posterior and lateral directions within ± 0.5 degrees.

(4) Establish the impact point at the chest midsagittal plane so that the impact point of the longitudinal centerline of the probe coincides with the midsagittal plane of the dummy within ± 2.5 mm (0.1 in) and is 12.7 ± 1.1 mm (0.5 ± 0.04 in) below the horizontal-peripheral centerline of the No. 3 rib and is within 0.5 degrees of a horizontal line in the dummy's midsagittal plane.

(5) Impact the thorax with the test probe so that at the moment of contact the probe's longitudinal center line falls within 2 degrees of a horizontal line in the dummy's midsagittal plane.

(6) Guide the test probe during impact so that there is no significant lateral, vertical or rotational movement.

(7) No suspension hardware, suspension cables, or any other attachments to the probe, including the velocity vane, shall make contact with the dummy during the test.

[65 FR 10968, Mar. 1, 2000, as amended at 67 FR 46415, July 15, 2002]

§ 572.135 Upper and lower torso assemblies and torso flexion test procedure.

(a) *Upper/lower torso assembly.* The test objective is to determine the stiffness effects of the lumbar spine (drawing 880105-1096), and abdominal insert (drawing 880105-434), on resistance to articulation between the upper torso assembly (drawing 880105-300) and the lower torso assembly (drawing 880105-450) (refer to § 572.130(a)(1)(iv)).

(b)(1) When the upper torso assembly of a seated dummy is subjected to a force continuously applied at the head to neck pivot pin level through a rigidly attached adaptor bracket as shown in Figure O4 according to the test procedure set out in subsection (c) of this section, the lumbar spine-abdomen assembly shall flex by an amount that permits the upper torso assembly to

translate in angular motion relative to the vertical transverse plane 45 ± 0.5 degrees at which time the force applied must be not less than 320 N (71.5 lbf) and not more than 390 N (87.4 lbf), and

(2) Upon removal of the force, the torso assembly must return to within 8 degrees of its initial position.

(c) *Test procedure.* The test procedure for the upper/lower torso assembly is as follows:

(1) Soak the dummy in a controlled environment at any temperature between 18.9 and 25.6 °C (66 and 78 °F) and a relative humidity between 10 and 70 percent for at least four hours prior to a test.

(2) Assemble the complete dummy (with or without the legs below the femurs) and attach to the fixture in a seated posture as shown in Figure O4.

(3) Secure the pelvis to the fixture at the pelvis instrument cavity rear face by threading four ¼ inch cap screws into the available threaded attachment holes. Tighten the mountings so that the test material is rigidly affixed to the test fixture and the pelvic-lumbar joining surface is horizontal.

(4) Attach the loading adapter bracket to the spine of the dummy as shown in Figure O4.

(5) Inspect and adjust, if necessary, the seating of the abdominal insert within the pelvis cavity and with respect to the torso flesh, assuring that the torso flesh provides uniform fit and overlap with respect to the outside surface of the pelvis flesh.

(6) Flex the dummy's upper torso three times between the vertical and until the torso reference plane, as shown in Figure O4, reaches 30 degrees from the vertical transverse plane. Bring the torso to vertical orientation and wait for 30 minutes before conducting the test. During the 30 minute waiting period, the dummy's upper torso shall be externally supported at or near its vertical orientation to prevent it from drooping.

(7) Remove all external support and wait two minutes. Measure the initial orientation angle of the torso reference plane of the seated, unsupported dummy as shown in Figure O4. The initial orientation angle may not exceed 20 degrees.

(8) Attach the pull cable and the load cell as shown in Figure O4.

(9) Apply a tension force in the midsagittal plane to the pull cable as shown in Figure O4 at any upper torso deflection rate between 0.5 and 1.5 degrees per second, until the angle reference plane is at 45 ± 0.5 degrees of flexion relative to the vertical transverse plane.

(9) Continue to apply a force sufficient to maintain 45 ± 0.5 degrees of flexion for 10 seconds, and record the highest applied force during the 10-second period.

(10) Release all force at the attachment bracket as rapidly as possible, and measure the return angle with respect to the initial angle reference plane as defined in paragraph (6) 3 minutes after the release.

§572.136 Knees and knee impact test procedure.

(a) *Knee assembly.* The knee assembly (refer to §§572.130(a)(1)(v) and (vi)) for the purpose of this test is the part of the leg assembly shown in drawing 880105-560.

(b)(1) When the knee assembly, consisting of sliding knee assembly (drawing 880105-528R or -528L), lower leg structural replacement (drawing 880105-603), lower leg flesh (drawing 880105-601), ankle assembly (drawing 880105-660), foot assembly (drawing 880105-651 or 650), and femur load transducer (drawing SA572-S14) or its structural replacement (drawing 78051-319) is tested according to the test procedure in subsection (c), the peak resistance force as measured with the test probe-mounted accelerometer must be not less than 3450 N (776 lbf) and not more than 4060 N (913 lbf).

(2) The force shall be calculated by the product of the impactor mass and its deceleration.

(c) *Test procedure.* The test procedure for the knee assembly is as follows:

(1) Soak the knee assembly in a controlled environment at any temperature between 18.9 and 25.6 °C (66 and 78 °F) and a relative humidity from 10 to 70 percent for at least four hours prior to a test.

(2) Mount the test material and secure it to a rigid test fixture as shown

in Figure O5. No part of the foot or tibia may contact any exterior surface.

(3) Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur.

(4) Guide the pendulum so that there is no significant lateral vertical or rotational movement at the time of initial contact between the impactor and the knee.

(5) The test probe velocity at the time of contact shall be 2.1 ± 0.03 m/s (6.9 ± 0.1 ft/s).

(6) No suspension hardware, suspension cables, or any other attachments to the probe, including the velocity vane, shall make contact with the dummy during the test.

[65 FR 10968, Mar. 1, 2000, as amended at 67 FR 46415, July 15, 2002]

§ 572.137 Test conditions and instrumentation.

(a) The test probe for thoracic impacts, except for attachments, shall be of rigid metallic construction and concentric about its longitudinal axis. Any attachments to the impactor, such as suspension hardware, impact vanes, etc., must meet the requirements of § 572.134(c)(7). The impactor shall have a mass of 13.97 ± 0.23 kg (30.8 ± 0.05 lbs) and a minimum mass moment of inertia of 3646 kg-cm^2 ($3.22 \text{ lbs-in-sec}^2$) in yaw and pitch about the CG of the probe. One-third (1/3) of the weight of suspension cables and any attachments to the impact probe must be included in the calculation of mass, and such components may not exceed five percent of the total weight of the test probe. The impacting end of the probe, perpendicular to and concentric with the longitudinal axis of the probe, has a flat, continuous, and non-deformable 152.4 ± 0.25 mm (6.00 ± 0.01 in) diameter face with a minimum/maximum edge radius of $7.6/12.7$ mm ($0.3/0.5$ in). The impactor shall have a 152.4 – 152.6 mm (6.0 – 6.1 in) diameter cylindrical surface extending for a minimum of 25 mm (1.0 in) to the rear from the impact face. The probe's end opposite to the impact face has provisions for mounting of an accelerometer with its sensitive axis collinear with the longitudinal axis of the probe. The impact probe has a free

air resonant frequency of not less than 1000 Hz, which may be determined using the procedure listed in Docket No. NHTSA-6714-14.

(b) The test probe for knee impacts, except for attachments, shall be of rigid metallic construction and concentric about its longitudinal axis. Any attachments to the impactor, such as suspension hardware, impact vanes, etc., must meet the requirements of § 572.136(c)(6). The impactor shall have a mass of 2.99 ± 0.23 kg (6.6 ± 0.05 lbs) and a minimum mass moment of inertia of 209 kg-cm^2 ($0.177 \text{ lb-in-sec}^2$) in yaw and pitch about the CG of the probe. One-third (1/3) of the weight of suspension cables and any attachments to the impact probe may be included in the calculation of mass, and such components may not exceed five percent of the total weight of the test probe. The impacting end of the probe, perpendicular to and concentric with the longitudinal axis of the probe, has a flat, continuous, and non-deformable 76.2 ± 0.2 mm (3.00 ± 0.01 in) diameter face with a minimum/maximum edge radius of $7.6/12.7$ mm ($0.3/0.5$ in). The impactor shall have a 76.2 – 76.4 mm (3.0 – 3.1 in) diameter cylindrical surface extending for a minimum of 12.5 mm (0.5 in) to the rear from the impact face. The probe's end opposite to the impact face has provisions for mounting an accelerometer with its sensitive axis collinear with the longitudinal axis of the probe. The impact probe has a free air resonant frequency of not less than 1000 Hz, which may be determined using the procedure listed in Docket No. NHTSA-6714-14.

(c) Head accelerometers shall have dimensions, response characteristics, and sensitive mass locations specified in drawing SA572-S4 and be mounted in the head as shown in drawing 880105-000 sheet 3 of 6.

(d) The upper neck force/moment transducer shall have the dimensions, response characteristics, and sensitive axis locations specified in drawing SA572-S11 and be mounted in the head neck assembly as shown in drawing 880105-000, sheet 3 of 6.

(e) The thorax accelerometers shall have the dimensions, response characteristics, and sensitive mass locations specified in drawing SA572-S4 and be

mounted in the torso assembly in tri-axial configuration within the spine box instrumentation cavity and as optional instrumentation in uniaxial forward-aft oriented configuration arranged as corresponding pairs in three locations on the sternum on and at the spine box of the upper torso assembly as shown in drawing 880105-000 sheet 3 of 6.

(f) The optional lumbar spine force-moment transducer shall have the dimensions, response characteristics, and sensitive axis locations specified in drawing SA572-S15 and be mounted in the lower torso assembly as shown in drawing 880105-450.

(g) The optional iliac spine force transducers shall have the dimensions and response characteristics specified in drawing SA572-S16 and be mounted in the torso assembly as shown in drawing 880105-450.

(h) The pelvis accelerometers shall have the dimensions, response characteristics, and sensitive mass locations specified in drawing SA572-S4 and be mounted in the torso assembly in tri-axial configuration in the pelvis bone as shown in drawing 880105-000 sheet 3.

(i) The single axis femur force transducer (SA572-S14) or the optional multiple axis femur force/moment transducer (SA572-S29) shall have the dimensions, response characteristics, and sensitive axis locations specified in the appropriate drawing and be mounted in the femur assembly as shown in drawing 880105-500 sheet 3 of 6.

(j) The chest deflection transducer shall have the dimensions and response characteristics specified in drawing SA572-S51 and be mounted to the upper torso assembly as shown in drawings 880105-300 and 880105-000 sheet 3 of 6.

(k) The optional lower neck force/moment transducer shall have the dimensions, response characteristics, and sensitive axis locations specified in drawing SA572-S27 and be mounted to the upper torso assembly as shown in drawing 880105-000 sheet 3 of 6.

(l) The optional thoracic spine force/moment transducer shall have the dimensions, response characteristics, and sensitive axis locations specified in drawing SA572-S28 and be mounted in the upper torso assembly as shown in drawing 880105-000 sheet 3 of 6.

(m) The outputs of acceleration and force-sensing devices installed in the dummy and in the test apparatus specified by this part shall be recorded in individual data channels that conform to SAE Recommended Practice J211/10, Rev. Mar95 "Instrumentation for Impact Impact Tests;—Part 1—Electronic Instrumentation," and SAE Recommended Practice J211/2, Rev Mar95 "Instrumentation for Impact Tests—Part 2—Photographic Instrumentation", (refer to §§ 572.130(a)(3) and (4) respectively) except as noted, with channel classes as follows:

- (1) Head acceleration—Class 1000
- (2) Neck:
 - (i) Forces—Class 1000
 - (ii) Moments—Class 600
 - (iii) Pendulum acceleration—Class 180
 - (iv) Rotation potentiometer—Class 60 (optional)
- (3) Thorax:
 - (i) Rib acceleration—Class 1000
 - (ii) Spine and pendulum accelerations—Class 180
 - (iii) Sternum deflection—Class 600
 - (iv) Forces—Class 1000
 - (v) Moments—Class 600
- (4) Lumbar:
 - (i) Forces—Class 1000
 - (ii) Moments—Class 600
 - (iii) Torso flexion pulling force—Class 60 if data channel is used
- (5) Pelvis:
 - (i) Accelerations—Class 1000
 - (ii) Iliac wing forces—Class 180
 - (6) Femur forces and knee pendulum—Class 600

(n) Coordinate signs for instrumentation polarity shall conform to the Sign Convention For Vehicle Crash Testing, Surface Vehicle Information Report, SAE J1733, 1994-12 (refer to section 572.130(a)(4)).

(o) The mountings for sensing devices shall have no resonance frequency less than 3 times the frequency range of the applicable channel class.

(p) Limb joints must be set at one G, barely restraining the weight of the limb when it is extended horizontally. The force needed to move a limb segment shall not exceed 2G throughout the range of limb motion.

(q) Performance tests of the same component, segment, assembly, or

Pt. 572, Subpt. O, Fig. O1

fully assembled dummy shall be separated in time by not less than 30 minutes unless otherwise noted.

(r) Surfaces of dummy components may not be painted except as specified

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in this subpart or in drawings subtended by this subpart.

[65 FR 10968, Mar. 1, 2000, as amended at 67 FR 46415, July 15, 2002]

FIGURES TO SUBPART O

FIGURE O1
NECK FLEXION TEST SETUP SPECIFICATIONS

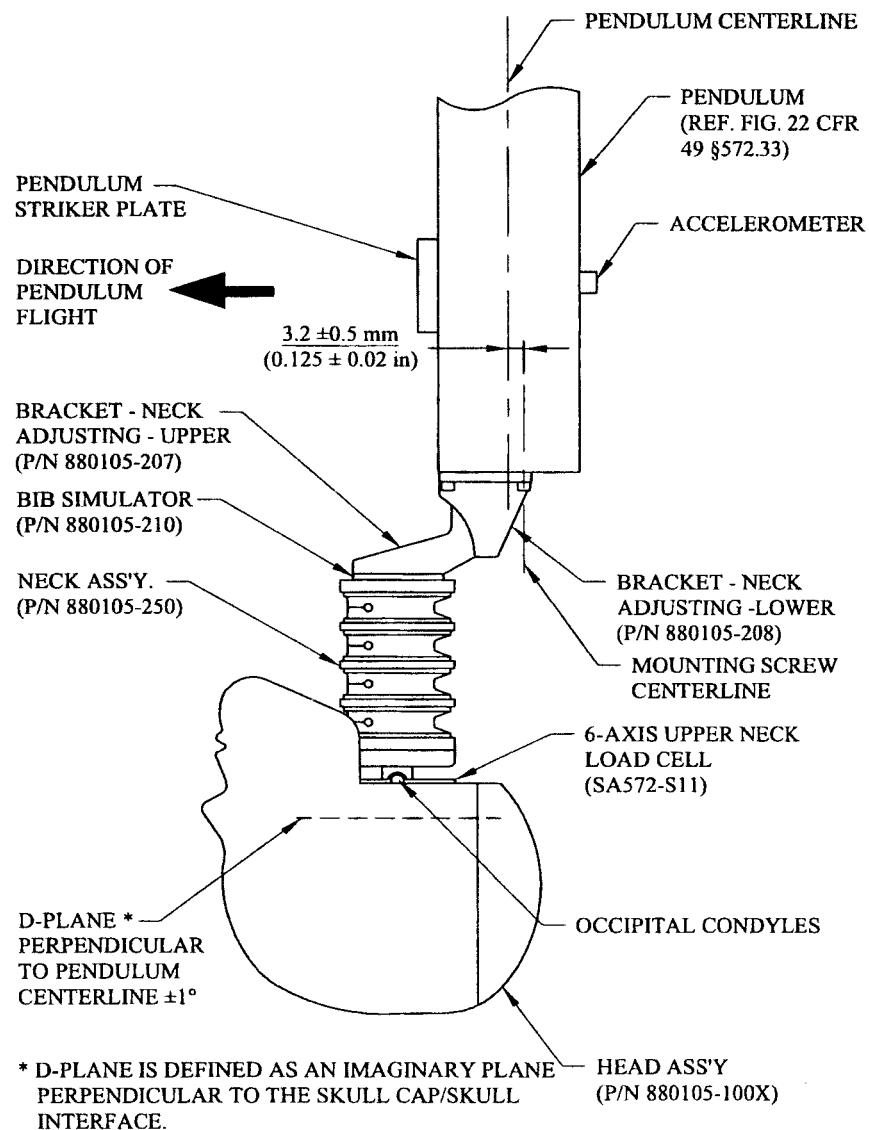


FIGURE O2
NECK EXTENSION TEST SETUP SPECIFICATIONS

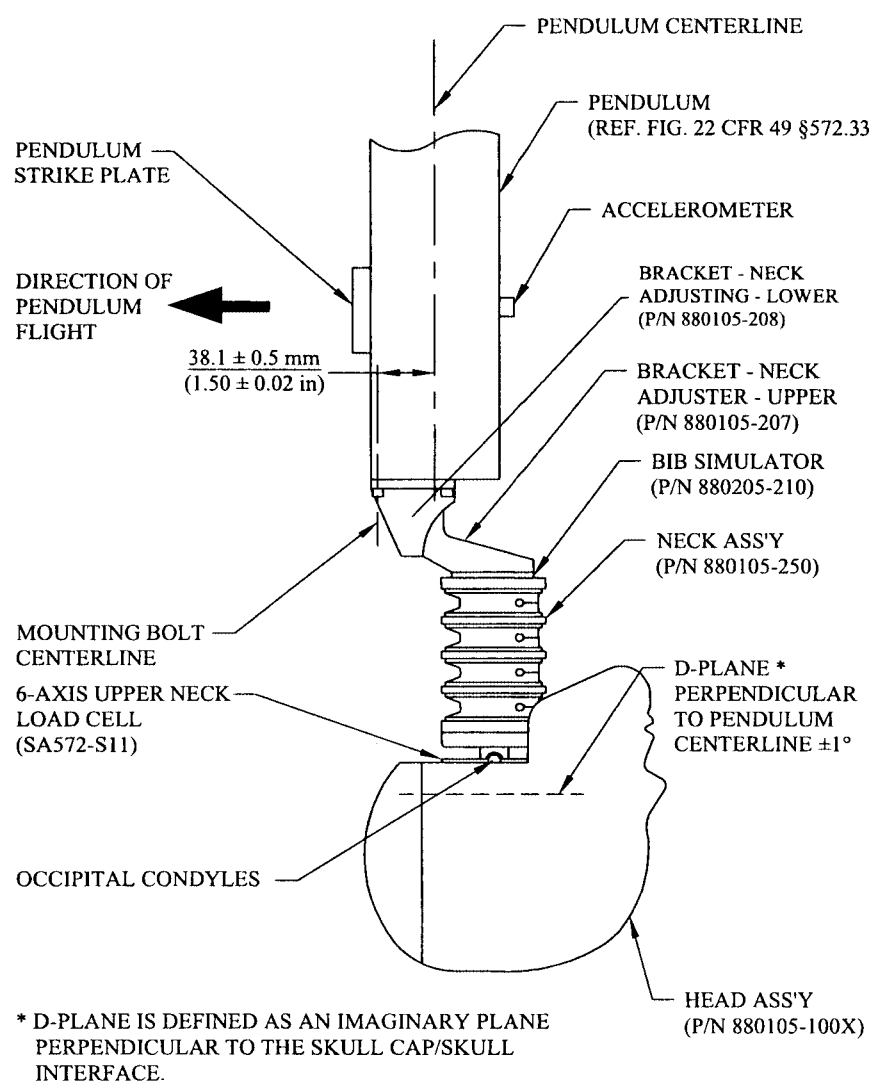
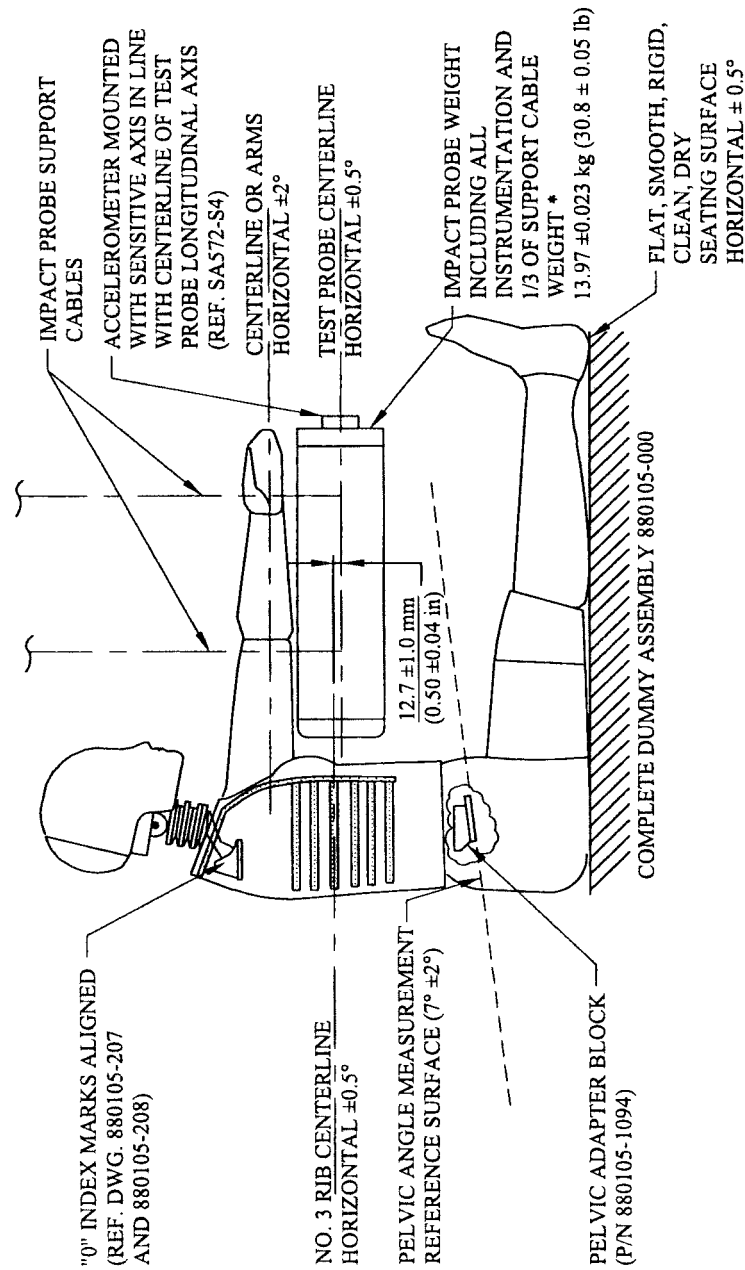


FIGURE O3
THORAX IMPACT TEST SETUP SPECIFICATIONS



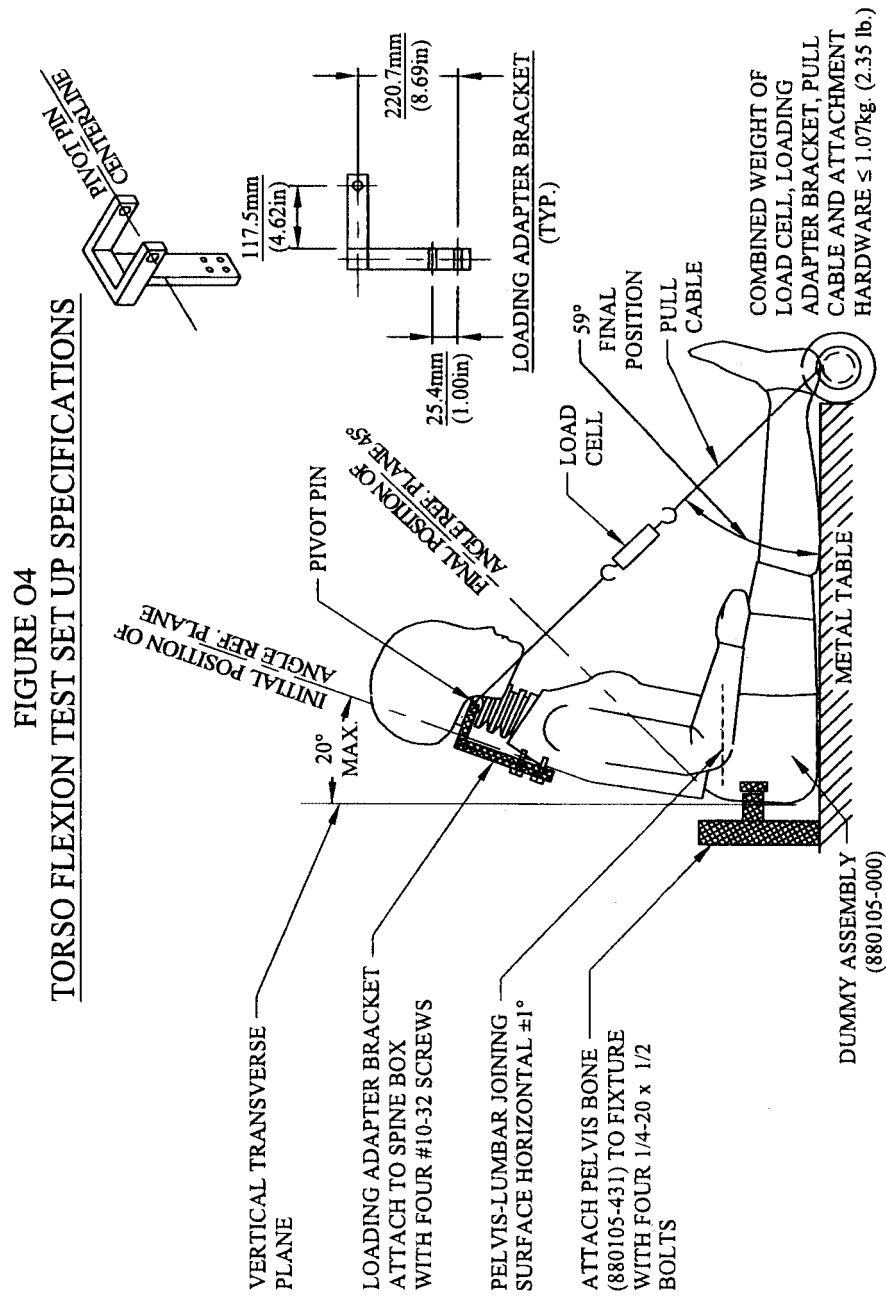
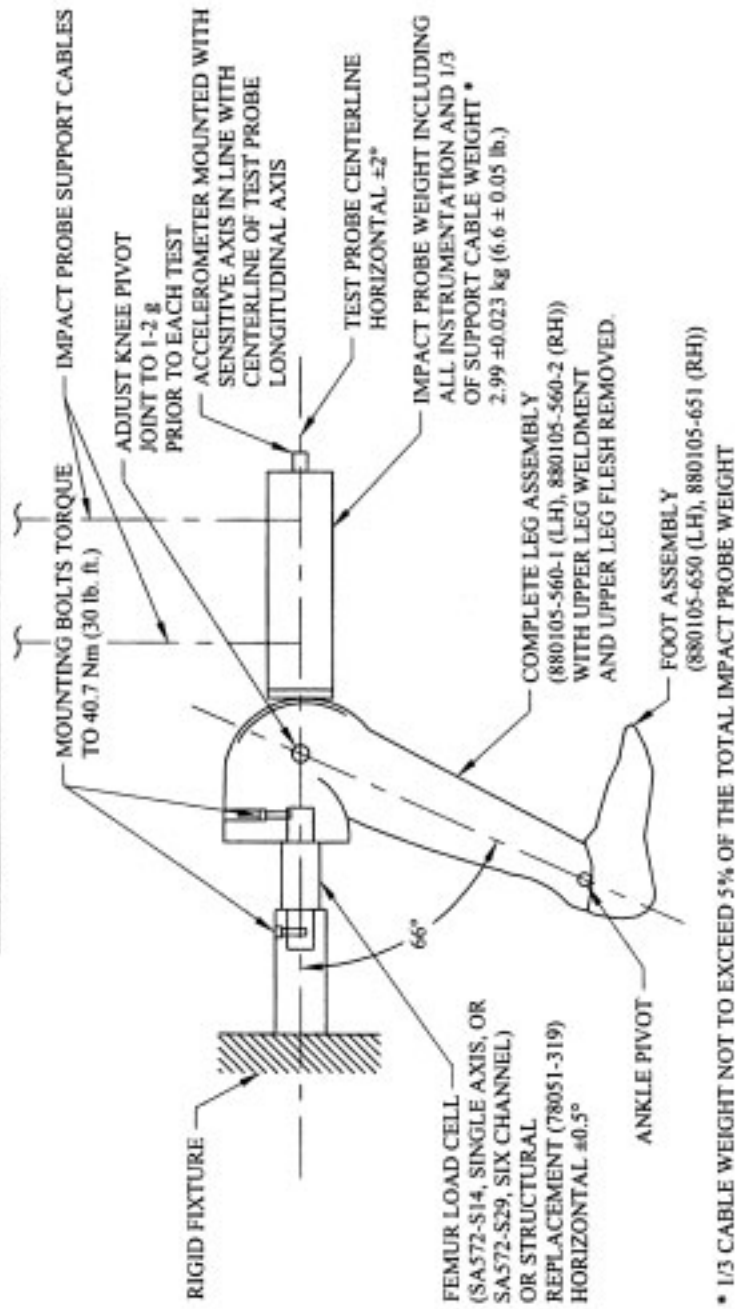


FIGURE O5
KNEE IMPACT TEST SETUP SPECIFICATIONS



§ 572.140

[65 FR 10968, Mar. 1, 2000, as amended at 67 FR 46415, July 15, 2002]

Subpart P—3-year-Old Child Crash Test Dummy, Alpha Version

SOURCE: 65 FR 15262, Mar. 22, 2000, unless otherwise noted.

§ 572.140 Incorporation by reference.

(a) The following materials are hereby incorporated in this subpart P by reference:

(1) A drawings and specifications package entitled, "Parts List and Drawings, Subpart P Hybrid III 3-year-old child crash test dummy, (H-III3C, Alpha version) September 2001," incorporated by reference in § 572.141 and consisting of:

(i) Drawing No. 210-1000, Head Assembly, incorporated by reference in §§ 572.141, 572.142, 572.144, 572.145, and 572.146;

(ii) Drawing No. 210-2001, Neck Assembly, incorporated by reference in §§ 572.141, 572.143, 572.144, 572.145, and 572.146;

(iii) Drawing No. TE-208-000, Headform, incorporated by reference in §§ 572.141, and 572.143;

(iv) Drawing No. 210-3000, Upper/Lower Torso Assembly, incorporated by reference in §§ 572.141, 572.144, 572.145, and 572.146;

(v) Drawing No. 210-5000-1(L), -2(R), Leg Assembly, incorporated by reference in §§ 572.141, 572.144, 572.145 as part of a complete dummy assembly;

(vi) Drawing No. 210-6000-1(L), -2(R), Arm Assembly, incorporated by reference in §§ 572.141, 572.144, and 572.145 as part of the complete dummy assembly;

(2) A procedures manual entitled "Procedures for Assembly, Disassembly and Inspection (PADI), Subpart P, Hybrid III 3-year-old Child Crash Test Dummy, (H-III3C, Alpha Version) September 2001," incorporated by reference in § 572.141;

(3) SAE Recommended Practice J211/1, Rev. Mar 95 "Instrumentation for Impact Tests—Part 1-Electronic Instrumentation", incorporated by reference in § 572.146;

(4) SAE J1733 1994-12 "Sign Convention for Vehicle Crash Testing" incorporated by reference in § 572.146.

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(5) The Director of the Federal Register approved those materials incorporated by reference in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51. Copies of the materials may be inspected at NHTSA's Docket Section, 400 Seventh Street SW, room 5109, Washington, DC, or at the Office of the Federal Register, 800 North Capitol Street, NW, Suite 700, Washington, DC.

(b) The incorporated materials are available as follows:

(1) The drawings and specifications package referred to in paragraph (a)(1) of this section and the PADI document referred to in paragraph (a)(2) of this section are accessible for viewing and copying at the Department of Transportation's Docket public area, Plaza 401, 400 Seventh St., SW., Washington, DC 20590, and downloadable at *dms.dot.gov*. They are also available from Reprographic Technologies, 9107 Gaither Rd., Gaithersburg, MD 20877, (301) 419-5070.

(2) The SAE materials referred to in paragraphs (a)(3) and (a)(4) of this section are available from the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.

[65 FR 15262, Mar. 22, 2000, as amended at 66 FR 64376, Dec. 13, 2001]

§ 572.141 General description.

(a) The Hybrid III 3-year-old child dummy is described by the following materials:

(1) Technical drawings and specifications package 210-0000 (refer to § 572.140(a)(1)), the titles of which are listed in Table A of this section;

(2) Procedures for Assembly, Disassembly and Inspection document (PADI) (refer to § 572.140(a)(2)).

(b) The dummy is made up of the component assemblies set out in the following Table A of this section:

TABLE A

Component assembly	Drawing No.
Head Assembly	210-1000
Neck Assembly (complete)	210-2001
Upper/Lower Torso Assembly	210-3000
Leg Assembly	210-5000-1(L), -2(R)
Arm Assembly	210-6000-1(L), -2(R)

(c) Adjacent segments are joined in a manner such that except for contacts existing under static conditions, there is no contact between metallic elements throughout the range of motion or under simulated crash impact conditions.

(d) The structural properties of the dummy are such that the dummy conforms to this part in every respect only before use in any test similar to those specified in Standard 208, *Occupant Crash Protection*, and Standard 213, *Child Restraint Systems*.

§572.142 Head assembly and test procedure.

(a) The head assembly (refer to §572.140(a)(1)(i)) for this test consists of the head (drawing 210-1000), adapter plate (drawing ATD 6259), accelerometer mounting block (drawing SA 572-S80), structural replacement of $\frac{1}{2}$ mass of the neck load transducer (drawing TE-107-001), head mounting washer (drawing ATD 6262), one $\frac{1}{2}$ -20x1" flat head cap screw (FHCS) (drawing 9000150), and 3 accelerometers (drawing SA-572-S4).

(b) When the head assembly in paragraph (a) of this section is dropped from a height of 376.0 ± 1.0 mm (14.8 ± 0.04 in) in accordance with paragraph (c) of this section, the peak resultant acceleration at the location of the accelerometers at the head CG shall not be less than 250 g or more than 280 g. The resultant acceleration versus time history curve shall be unimodal, and the oscillations occurring after the main pulse shall be less than 10 percent of the peak resultant acceleration. The lateral acceleration shall not exceed ± 15 G (zero to peak).

(c) *Head test procedure.* The test procedure for the head is as follows:

(1) Soak the head assembly in a controlled environment at any temperature between 18.9 and 25.6 °C (66 and 78 °F) and at any relative humidity between 10 and 70 percent for at least four hours prior to a test.

(2) Prior to the test, clean the impact surface of the head skin and the steel impact plate surface with isopropyl alcohol, trichlorethane, or an equivalent. Both impact surfaces must be clean and dry for testing.

(3) Suspend the head assembly with its midsagittal plane in vertical orientation as shown in Figure P1 of this subpart. The lowest point on the forehead is 376.0 ± 1.0 mm (14.76 ± 0.04 in) from the steel impact surface. The 3.3 mm (0.13 in) diameter holes, located on either side of the dummy's head in transverse alignment with the CG, shall be used to ensure that the head transverse plane is level with respect to the impact surface.

(4) Drop the head assembly from the specified height by a means that ensures a smooth, instant release onto a rigidly supported flat horizontal steel plate which is 50.8 mm (2 in) thick and 610 mm (24 in) square. The impact surface shall be clean, dry and have a finish of not less than 203.2×10^{-6} mm (8 micro inches) (RMS) and not more than 2032.0×10^{-6} mm (80 micro inches) (RMS).

(5) Allow at least 2 hours between successive tests on the same head.

§572.143 Neck-headform assembly and test procedure.

(a) The neck and headform assembly (refer to §§572.140(a)(1)(ii) and 572.140(a)(1)(iii)) for the purposes of this test, as shown in Figures P2 and P3 of this subpart, consists of the neck molded assembly (drawing 210-2015), neck cable (drawing 210-2040), nylon shoulder bushing (drawing 9001373), upper mount plate insert (drawing 910420-048), bib simulator (drawing TE-208-050), urethane washer (drawing 210-2050), neck mounting plate (drawing TE-250-021), two jam nuts (drawing 9001336), load-moment transducer (drawing SA 572-S19), and headform (drawing TE-208-000).

(b) When the neck and headform assembly, as defined in §572.143(a), is tested according to the test procedure in paragraph (c) of this section, it shall have the following characteristics:

(1) Flexion.

(i) Plane D, referenced in Figure P2 of this subpart, shall rotate in the direction of preimpact flight with respect to the pendulum's longitudinal centerline between 70 degrees and 82 degrees. Within this specified rotation corridor, the peak moment about the occipital condyle may not be less than 42 N-m and not more than 53 N-m.

§ 572.144

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(ii) The positive moment shall decay for the first time to 10 N-m between 60 ms and 80 ms after time zero.

(iii) The moment and rotation data channels are defined to be zero when the longitudinal centerline of the neck and pendulum are parallel.

(2) Extension.

(i) Plane D referenced in Figure P3 of this subpart shall rotate in the direction of preimpact flight with respect to the pendulum's longitudinal centerline between 83 degrees and 93 degrees. Within this specified rotation corridor, the peak moment about the occipital condyle may be not more than –43.7 N-m and not less than –53.3 N-m.

(ii) The negative moment shall decay for the first time to –10 N-m between 60 and 80 ms after time zero.

(iii) The moment and rotation data channels are defined to be zero when the longitudinal centerline of the neck and pendulum are parallel.

(c) *Test procedure.* (1) Soak the neck assembly in a controlled environment at any temperature between 20.6 and 22.2 °C (69 and 72 F) and a relative humidity between 10 and 70 percent for at least four hours prior to a test.

(2) Torque the jam nut (drawing 9001336) on the neck cable (drawing 210–2040) between 0.2 N-m and 0.3 N-m.

(3) Mount the neck-headform assembly, defined in paragraph (a) of this section, on the pendulum so the midsagittal plane of the headform is vertical and coincides with the plane of motion of the pendulum as shown in Figure P2 of this subpart for flexion and Figure P3 of this subpart for extension tests.

(4) Release the pendulum and allow it to fall freely to achieve an impact velocity of 5.50 ± 0.10 m/s (18.05 ± 0.40 ft/s) for flexion and 3.65 ± 0.1 m/s (11.98 ± 0.40 ft/s) for extension tests, measured by an accelerometer mounted on the pendulum as shown in Figure 22 of this part 572 at time zero.

(i) The test shall be conducted without inducing any torsion twisting of the neck.

(ii) Stop the pendulum from the initial velocity with an acceleration vs. time pulse which meets the velocity change as specified in Table B of this section. Integrate the pendulum acceleration data channel to obtain the velocity vs. time curve as indicated in Table B of this section.

(iii) Time-zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. The pendulum data channel shall be zero at this time.

TABLE B—PENDULUM PULSE

Time	Flexion		Time	Extension	
	m/s	ft/s		m/s	ft/s
10	2.0–2.7	6.6–8.9	6	1.0–1.4	3.3–4.6
15	3.0–4.0	9.8–13.1	10	1.9–2.5	6.2–8.2
20	4.0–5.1	13.1–16.7	14	2.8–3.5	9.2–11.5

§ 572.144 Thorax assembly and test procedure.

(a) *Thorax (upper torso) assembly (refer to § 572.140(a)(1)(iv)).* The thorax consists of the upper part of the torso assembly shown in drawing 210–3000.

(b) When the anterior surface of the thorax of a completely assembled dummy (drawing 210–0000) is impacted by a test probe conforming to § 572.146(a) at 6.0 ± 0.1 m/s (19.7 ± 0.3 ft/s) according to the test procedure in paragraph (c) of this section.

(1) Maximum sternum displacement (compression) relative to the spine,

measured with the chest deflection transducer (SA–572–S50), must not be less than 32mm (1.3 in) and not more than 38mm (1.5 in). Within this specified compression corridor, the peak force, measured by the probe-mounted accelerometer as defined in § 572.146(a) and calculated in accordance with paragraph (b)(3) of this section, shall be not less than 680 N and not more than 810 N. The peak force after 12.5 mm of sternum compression but before reaching the minimum required 32.0 mm sternum compression shall not exceed 910 N.

(2) The internal hysteresis of the ribcage in each impact, as determined from the force vs. deflection curve, shall be not less than 65 percent and not more than 85 percent. The hysteresis shall be calculated by determining the ratio of the area between the loading and unloading portions of the force deflection curve to the area under the loading portion of the curve.

(3) The force shall be calculated by the product of the impactor mass and its deceleration.

(c) *Test procedure.* The test procedure for the thorax assembly is as follows:

(1) The test dummy is clothed in cotton-polyester-based tight-fitting shirt with long sleeves and ankle-length pants whose combined weight is not more than 0.25 kg (0.55 lbs).

(2) Soak the dummy in a controlled environment at any temperature between 20.6 and 22.2 °C (69 and 72 °F) and at any relative humidity between 10 and 70 percent for at least four hours prior to a test.

(3) Seat and orient the dummy on a seating surface without back support as shown in Figure P4, with the lower limbs extended horizontally and forward, the upper arms parallel to the torso and the lower arms extended horizontally and forward, parallel to the midsagittal plane, the midsagittal plane being vertical within ±1 degree and the ribs level in the anterior-posterior and lateral directions within ±0.5 degrees.

(4) Establish the impact point at the chest midsagittal plane so that the impact point of the longitudinal centerline of the probe coincides with the dummy's mid-sagittal plane and is centered on the center of No. 2 rib within ±2.5 mm (0.1 in.) and 0.5 degrees of a horizontal plane.

(5) Impact the thorax with the test probe so that at the moment of contact the probe's longitudinal center line is within 2 degrees of a horizontal line in the dummy's midsagittal plane.

(6) Guide the test probe during impact so that there is no significant lateral, vertical or rotational movement.

(7) No suspension hardware, suspension cables, or any other attachments to the probe, including the velocity

vane, shall make contact with the dummy during the test.

[65 FR 15262, Mar. 22, 2000, as amended at 66 FR 64376, Dec. 13, 2001]

§572.145 Upper and lower torso assemblies and torso flexion test procedure.

(a) The test objective is to determine the resistance of the lumbar spine and abdomen of a fully assembled dummy (drawing 210-0000) to flexion articulation between upper and lower halves of the torso assembly (refer to §572.140(a)(1)(iv)).

(b)(1) When the upper half of the torso assembly of a seated dummy is subjected to a force continuously applied at the occipital condyle level through the rigidly attached adaptor bracket in accordance with the test procedure set out in paragraph (c) of this section, the lumbar spine-abdomen assembly shall flex by an amount that permits the upper half of the torso, as measured at the posterior surface of the torso reference plane shown in Figure P5 of this subpart, to translate in angular motion in the midsagittal plane 45 ±0.5 degrees relative to the vertical transverse plane, at which time the pulling force applied must not be less than 130 N (28.8 lbf) and not more than 180 N (41.2 lbf), and

(2) Upon removal of the force, the upper torso assembly returns to within 10 degrees of its initial position.

(c) *Test procedure.* The test procedure is as follows:

(1) Soak the dummy in a controlled environment at any temperature between 18.9° and 25.6 °C (66 and 78 °F) and at any relative humidity between 10 and 70 percent for at least 4 hours prior to a test.

(2) Assemble the complete dummy (with or without the lower legs) and seat it on a rigid flat-surface table, as shown in Figure P5 of this subpart.

(i) Unzip the torso jacket and remove the four ¼-20×¾" bolts which attach the lumbar load transducer or its structural replacement to the pelvis weldment (drawing 210-4510) as shown in Figure P5 of this subpart.

(ii) Position the matching end of the rigid pelvis attachment fixture around the lumbar spine and align it over the four bolt holes.

(iii) Secure the fixture to the dummy with the four $\frac{1}{4}$ –20 $\times\frac{3}{4}$ " bolts and attach the fixture to the table. Tighten the mountings so that the pelvis-lumbar joining surface is horizontal within ± 1 deg and the buttocks and upper legs of the seated dummy are in contact with the test surface.

(iv) Attach the loading adapter bracket to the upper part of the torso as shown in Figure P5 of this subpart and zip up the torso jacket.

(v) Point the upper arms vertically downward and the lower arms forward.

(3)(i) Flex the thorax forward three times from vertical until the torso reference plane reaches 30 ± 2 degrees from vertical. The torso reference plane, as shown in figure P5 of this subpart, is defined by the transverse plane tangent to the posterior surface of the upper backplate of the spine box weldment (drawing 210–8020).

(ii) Remove all externally applied flexion forces and support the upper torso half in a vertical orientation for 30 minutes to prevent it from drooping.

(4) Remove the external support and after two minutes measure the initial orientation angle of the upper torso reference plane of the seated, unsupported dummy as shown in Figure P5 of this subpart. The initial orientation of the torso reference plane may not exceed 15 degrees.

(5) Attach the pull cable at the point of load application on the adaptor bracket while maintaining the initial torso orientation. Apply a pulling force in the midsagittal plane, as shown in Figure P5 of this subpart, at any upper torso flexion rate between 0.5 and 1.5 degrees per second, until the torso reference plane reaches 45 ± 0.5 degrees of flexion relative to the vertical transverse plane.

(6) Continue to apply a force sufficient to maintain 45 ± 0.5 degrees of flexion for 10 seconds, and record the highest applied force during the 10-second period.

(7) [Reserved]

(8) Release all force at the loading adaptor bracket as rapidly as possible and measure the return angle with respect to the initial angle reference plane as defined in paragraph (c)(4) of this section 3 to 4 minutes after the release.

§ 572.146 Test conditions and instrumentation.

(a) The test probe for thoracic impacts, except for attachments, shall be of rigid metallic construction and concentric about its longitudinal axis. Any attachments to the impactor such as suspension hardware, and impact vanes, must meet the requirements of § 572.144(c)(7) of this part. The impactor shall have a mass of 1.70 ± 0.02 kg (3.75 ± 0.05 lb) and a minimum mass moment of inertia 164 kg-cm^2 ($0.145 \text{ lb-in-sec}^2$) in yaw and pitch about the CG of the probe. One-third ($\frac{1}{3}$) of the weight of suspension cables and any attachments to the impact probe must be included in the calculation of mass, and such components may not exceed five percent of the total weight of the test probe. The impacting end of the probe, perpendicular to and concentric with the longitudinal axis of the probe, has a flat, continuous, and non-deformable 50.8 ± 0.25 mm (2.00 ± 0.01 inch) diameter face with an edge radius of $7.6/12.7$ mm ($0.3/0.5$ in). The impactor shall have a 53.3 mm (2.1 in) dia. cylindrical surface extending for a minimum of 25.4 mm (1.0 in) to the rear from the impact face. The probe's end opposite to the impact face has provisions for mounting an accelerometer with its sensitive axis collinear with the longitudinal axis of the probe. The impact probe has a free air resonant frequency not less than 1000 Hz limited to the direction of the longitudinal axis of the impactor.

(b) Head accelerometers shall have the dimensions, response characteristics, and sensitive mass locations specified in drawing SA 572–S4 and be mounted in the head as shown in drawing 210–0000.

(c) The neck force-moment transducer shall have the dimensions, response characteristics, and sensitive axis locations specified in drawing SA 572–S19 and be mounted at the upper neck transducer location as shown in drawing 210–0000. A lower neck transducer as specified in drawing SA 572–S19 is allowed to be mounted as optional instrumentation in place of part No. ATD6204, as shown in drawing 210–0000.

(d) The shoulder force transducers shall have the dimensions and response characteristics specified in drawing SA

572-S21 and be allowed to be mounted as optional instrumentation in place of part No. 210-3800 in the torso assembly as shown in drawing 210-0000.

(e) The thorax accelerometers shall have the dimensions, response characteristics, and sensitive mass locations specified in drawing SA 572-S4 and be mounted in the torso assembly in triaxial configuration at the T4 location, as shown in drawing 210-0000. Triaxial accelerometers may be mounted as optional instrumentation at T1, and T12, and in uniaxial configuration on the sternum at the midpoint level of ribs No. 1 and No. 3 and on the spine coinciding with the midpoint level of No. 3 rib, as shown in drawing 210-0000. If used, the accelerometers must conform to SA-572-S4.

(f) The chest deflection potentiometer shall have the dimensions and response characteristics specified in drawing SA-572-S50 and be mounted in the torso assembly as shown drawing 210-0000.

(g) The lumbar spine force/moment transducer may be mounted in the torso assembly as shown in drawing 210-0000 as optional instrumentation in place of part No. 210-4150. If used, the transducer shall have the dimensions and response characteristics specified in drawing SA-572-S20.

(h) The pubic force transducer may be mounted in the torso assembly as shown in drawing 210-0000 as optional instrumentation in place of part No. 921-0022-036. If used, the transducer shall have the dimensions and response characteristics specified in drawing SA-572-S18.

(i) The acetabulum force transducers may be mounted in the torso assembly as shown in drawing 210-0000 as optional instrumentation in place of part No. 210-4522. If used, the transducer shall have the dimensions and response characteristics specified in drawing SA-572-S22.

(j) The anterior-superior iliac spine transducers may be mounted in the torso assembly as shown in drawing 210-0000 as optional instrumentation in place of part No. 210-4540-1, -2. If used, the transducers shall have the dimensions and response characteristics specified in drawing SA-572-S17.

(k) The pelvis accelerometers may be mounted in the pelvis in triaxial configuration as shown in drawing 210-0000 as optional instrumentation. If used, the accelerometers shall have the dimensions and response characteristics specified in drawing SA-572-S4.

(l) The outputs of acceleration and force-sensing devices installed in the dummy and in the test apparatus specified by this part shall be recorded in individual data channels that conform to the requirements of SAE Recommended Practice J211/1, Rev. Mar 95 "Instrumentation for Impact Tests—Part 1-Electronic Instrumentation" (refer to §572.140(a)(3)), with channel classes as follows:

- (1) Head acceleration—Class 1000
- (2) Neck
 - (i) Force—Class 1000
 - (ii) Moments—Class 600
 - (iii) Pendulum acceleration—Class 180
 - (iv) Rotation potentiometer response (if used)—CFC 60.
- (3) Thorax:
 - (i) Rib/sternum acceleration—Class 1000
 - (ii) Spine and pendulum accelerations—Class 180
 - (iii) Sternum deflection—Class 600
 - (iv) Shoulder force—Class 180
- (4) Lumbar:
 - (i) Forces—Class 1000
 - (ii) Moments—Class 600
 - (iii) Torso flexion pulling force—Class 60 if data channel is used
- (5) Pelvis
 - (i) Accelerations—Class 1000
 - (ii) Acetabulum, pubic symphysis—Class 1000,
 - (iii) Iliac wing forces—Class 180
- (m) Coordinate signs for instrumentation polarity shall conform to the Sign Convention For Vehicle Crash Testing, Surface Vehicle Information Report, SAE J1733, 1994-12 (refer to §572.140(a)(4)).
- (n) The mountings for sensing devices shall have no resonance frequency less than 3 times the frequency range of the applicable channel class.
- (o) Limb joints shall be set at 1G, barely restraining the weight of the limbs when they are extended horizontally. The force required to move a limb segment shall not exceed 2G throughout the range of limb motion.

(p) Performance tests of the same component, segment, assembly, or fully assembled dummy shall be separated in time by a period of not less than 30 minutes unless otherwise noted.

(q) Surfaces of dummy components are not painted except as specified in this part or in drawings subtended by this part.

FIGURES TO SUBPART P

Figure P1
HEAD DROP TEST SET-UP SPECIFICATIONS

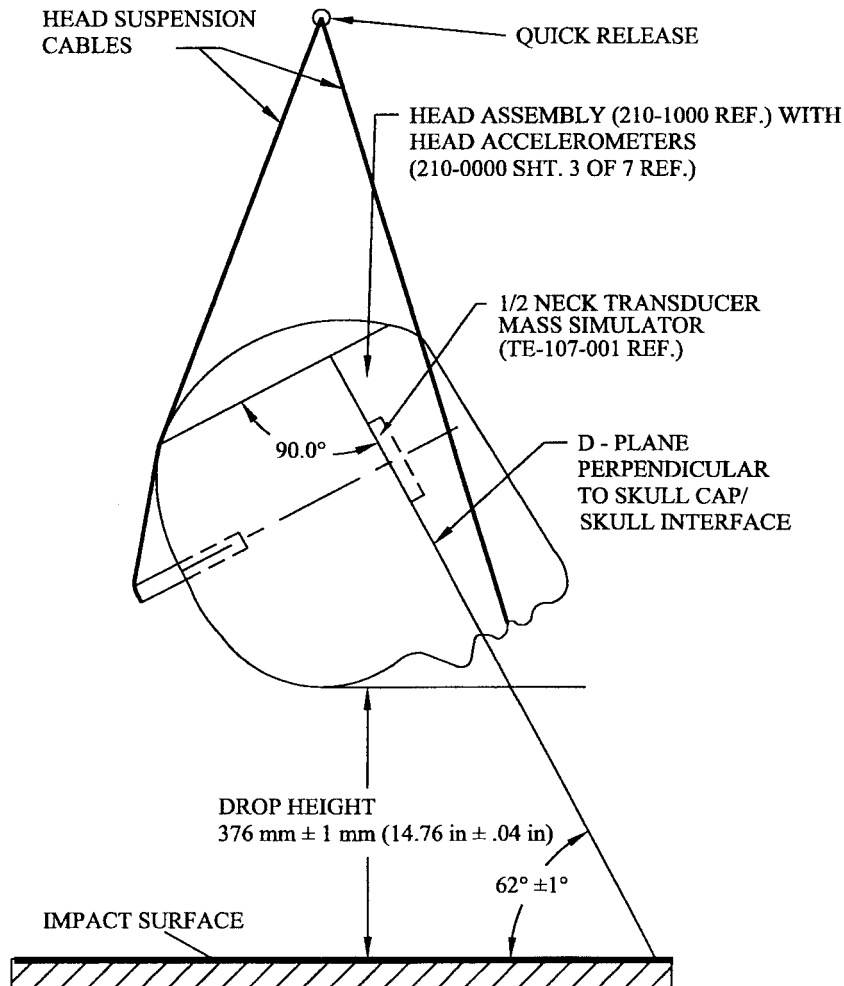
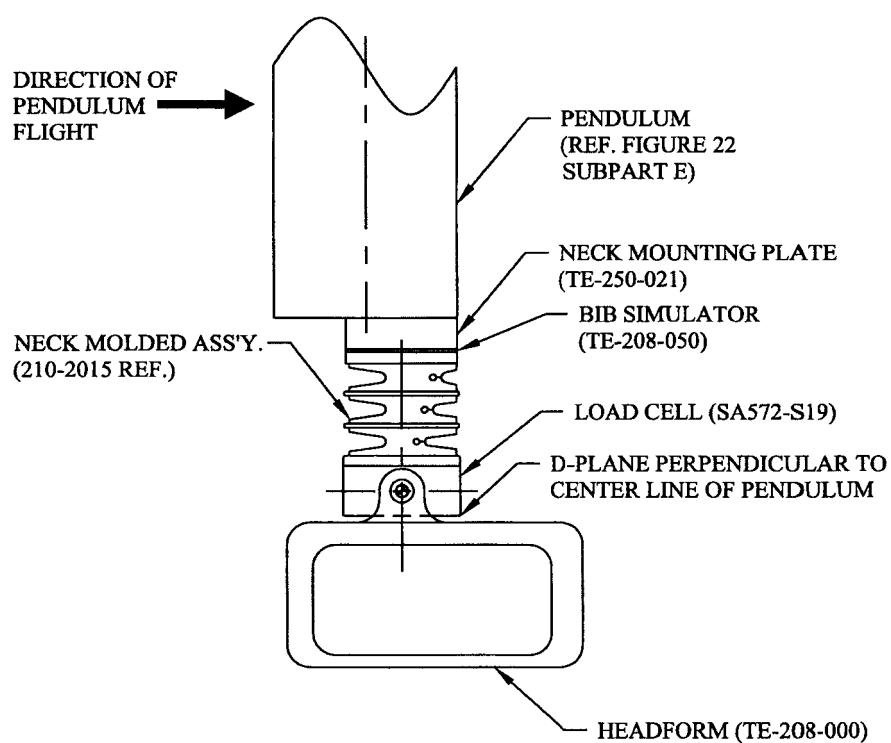
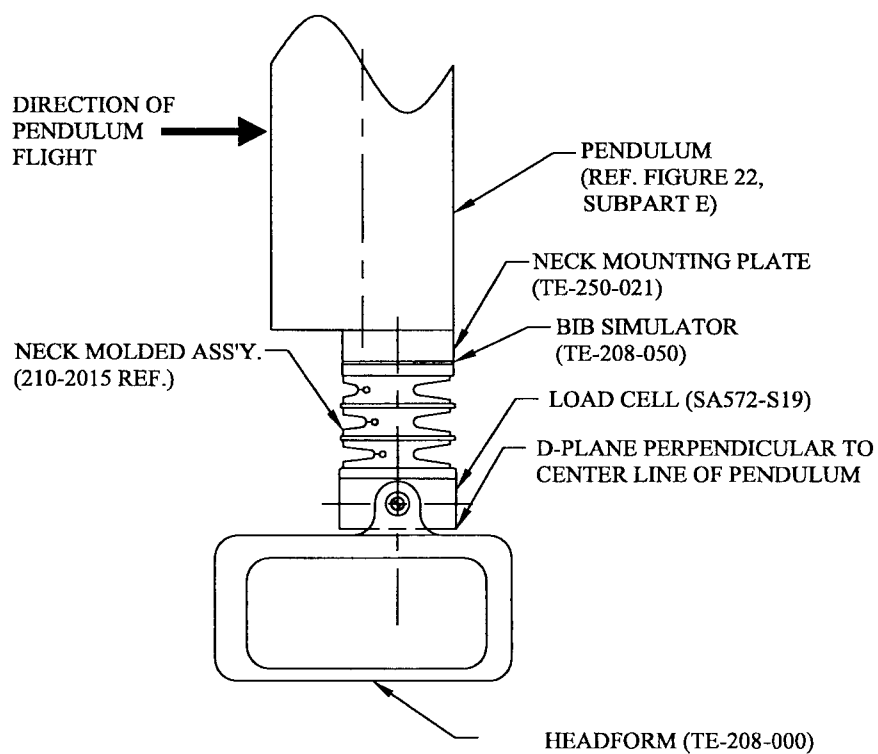


Figure P2
NECK FLEXION TEST SET-UP SPECIFICATIONS



NOTE: MOUNT NECK AT LEADING EDGE OF PENDULUM TO AVOID INTERFERENCE WITH HEADFORM MOTION. PENDULUM SHOWN IN VERTICAL ORIENTATION.

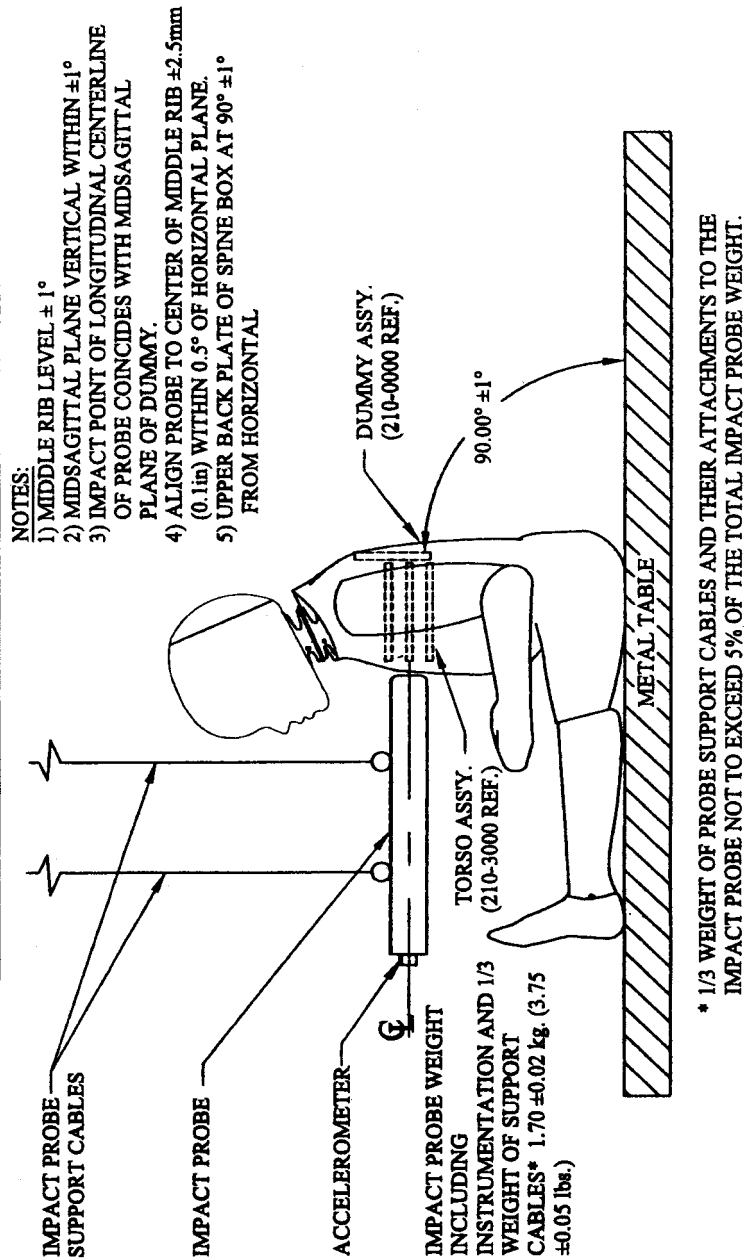
Figure P3
NECK EXTENSION TEST SET-UP SPECIFICATIONS

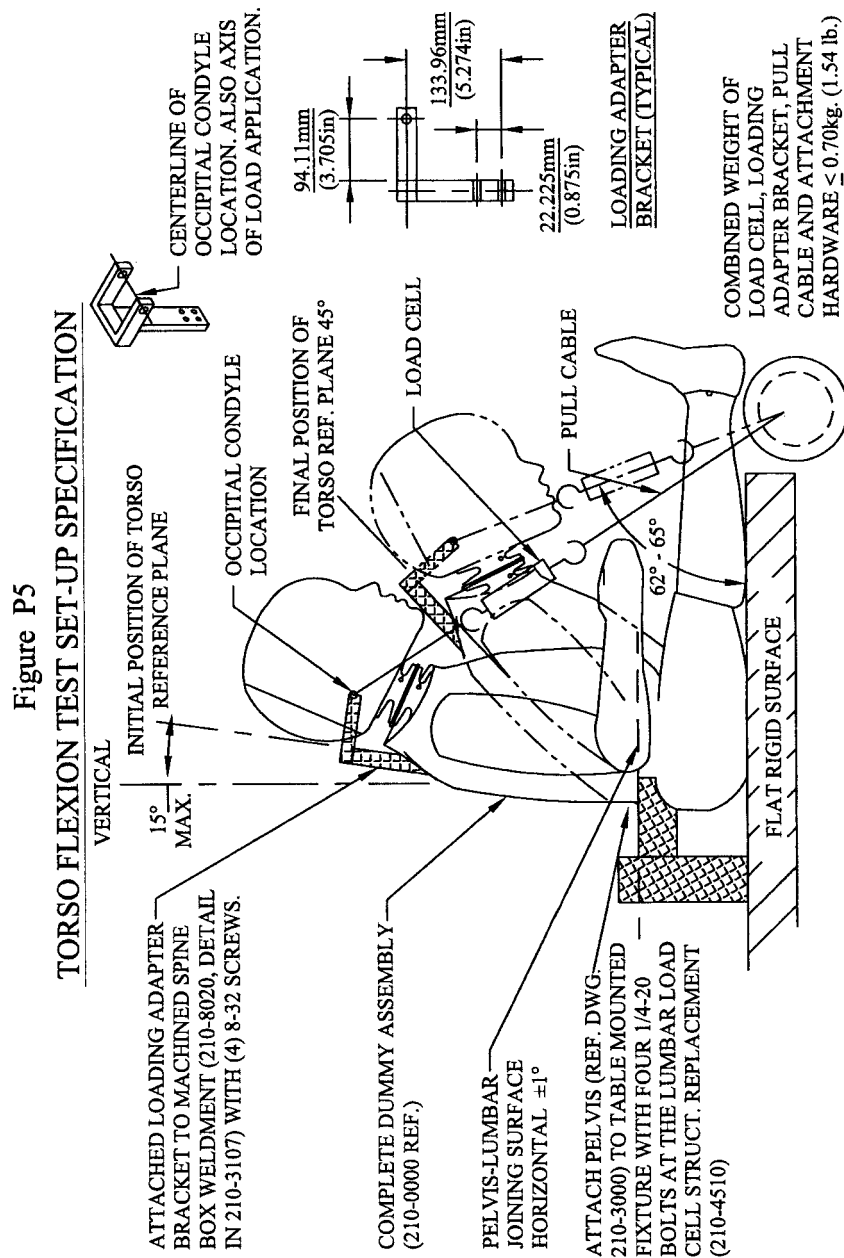


NOTE: MOUNT NECK AT LEADING EDGE OF PENDULUM TO AVOID INTERFERENCE WITH HEADFORM MOTION.
PENDULUM SHOWN IN VERTICAL ORIENTATION.

Figure P4

THORAX IMPACT TEST SET-UP SPECIFICATIONS





[65 FR 15262, Mar. 22, 2000, as amended at 66 FR 64376, Dec. 13, 2001]

Subpart R—CRABI 12-Month-Old Infant, Alpha Version

SOURCE: 65 FR 17188, Mar. 31, 2000, unless otherwise noted.

§572.150 Incorporation by reference.

(a) The following materials are incorporated by reference in this subpart R.

(1) A drawings and specifications package entitled "Parts List and Drawings, Subpart R, CRABI 12-Month-Old Infant Crash Test Dummy (CRABI-12, Alpha version) August 2001" and consisting of:

(i) Drawing No. 921022-001, Head Assembly, incorporated by reference in §§ 572.151, 572.152, 572.154, and 572.155;

(ii) Drawing No. 921022-041, Neck Assembly, incorporated by reference in §§ 572.151, 572.153, 572.154, and 572.155;

(iii) Drawing No. TE-3200-160, Headform, incorporated by reference in §§ 572.151 and 572.153;

(iv) Drawing No. 921022-060, Torso Assembly, incorporated by reference in §§ 572.151, 572.154, and 572.155;

(v) Drawing No. 921022-055, Leg Assembly, incorporated by reference in §§ 572.151, and 572.155 as part of a complete dummy assembly;

(vi) Drawing No. 921022-054, Arm Assembly, incorporated by reference in §§ 572.151, and 572.155 as part of the complete dummy assembly;

(2) A procedures manual entitled "Procedures for Assembly, Disassembly and Inspection (PADI) Subpart R, CRABI 12-Month-Old Infant Crash Test Dummy (CRABI-12, Alpha version) August 2001" incorporated by reference in § 572.155;

(3) SAE Recommended Practice J211/1, Rev. Mar95 "Instrumentation for Impact Tests—Part 1—Electronic Instrumentation", incorporated by reference in § 572.155;

(4) SAE J1733 1994-12 "Sign Convention for Vehicle Crash Testing", incorporated by reference in § 572.155.

(b) The Director of the Federal Register approved those materials incorporated by reference in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51. Copies of the materials may be inspected at NHTSA's Docket Section,

400 Seventh Street S.W., room 5109, Washington, DC, or at the Office of the Federal Register, 800 North Capitol Street, NW, Suite 700, Washington, DC.

(c) The incorporated materials are available as follows:

(1) The drawings and specifications package referred to in paragraph (a)(1) of this section and the procedures manual referred to in paragraph (a)(2) of this section are available from Reprographic Technologies, 9000 Virginia Manor Road, Beltsville, MD 20705 (301) 419-5070.

(2) The SAE materials referred to paragraphs (a)(3) and (a)(4) of this section are available from the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.

[65 FR 17188, Mar. 31, 2000, as amended at 66 FR 45784, Aug. 30, 2001]

§572.151 General description.

(a) The 12-month-old-infant crash test dummy is described by drawings and specifications containing the following materials:

(1) Technical drawings and specifications package 921022-000 (refer to § 572.150(a)(1)), the titles of which are listed in Table A of this section;

(2) Procedures for Assembly, Disassembly and Inspection document (PADI) (refer to § 572.150(a)(2)).

(b) The dummy consists of the component assemblies set out in the following Table A:

TABLE A

Component assembly	Drawing number
Head Assembly	921022-001.
Neck Assembly (complete)	921022-041.
Torso Assembly	921022-060.
Leg Assembly	921022-055 R&L.
Arm Assembly	921022-054 R&L.

(c) Adjacent segments of the dummy are joined in a manner such that, except for contacts existing under static conditions, there is no contact between metallic elements throughout the range of motion or under simulated crash impact conditions.

(d) The structural properties of the dummy are such that the dummy shall conform to this Subpart in every respect before its use in any test under this chapter.

§ 572.152 Head assembly and test procedure.

(a) The head assembly (refer to § 572.150(a)(1)(i)) for this test consists of the assembly (drawing 921022-001), tri-axial mount block (SA572-80), and 3 accelerometers (drawing SA572-S4).

(b) *Frontal and rear impact.* (1) *Frontal impact.* When the head assembly in paragraph (a) of this section is dropped from a height of 376.0 ± 1.0 mm (14.8 ± 0.04 in) in accordance with paragraph (c)(3)(i) of this section, the peak resultant acceleration measured at the head CG shall not be less than 100 g or more than 120 g. The resultant acceleration vs. time history curve shall be unimodal, and the oscillations occurring after the main pulse shall be less than 17 percent of the peak resultant acceleration. The lateral acceleration shall not exceed ± 15 g's.

(2) *Rear impact.* When the head assembly in paragraph (a) of this section is dropped from a height of 376.0 ± 1.0 mm (14.8 ± 0.04 in) in accordance with paragraph (c)(3)(ii) of this section, the peak resultant acceleration measured at the head CG shall be not less than 55 g and not more than 71 g. The resultant acceleration vs. time history curve shall be unimodal, and the oscillations occurring after the main pulse shall be less than 17 percent of the peak resultant acceleration. The lateral acceleration shall not exceed ± 15 g's.

(c) *Head test procedure.* The test procedure for the head is as follows:

(1) Soak the head assembly in a controlled environment at any temperature between 18.9 and 25.6 °C (66 and 78 °F) and at any relative humidity between 10 and 70 percent for at least four hours prior to a test. These temperature and humidity levels shall be maintained throughout the entire testing period specified in this section.

(2) Before the test, clean the impact surface of the head skin and the steel impact plate surface with isopropyl alcohol, trichlorethane, or an equivalent. Both impact surfaces shall be clean and dry for testing.

(3)(i) For a frontal impact test, suspend the head assembly with its midsagittal plane in vertical orientation as shown in Figure R1 of this subpart. The lowest point on the forehead is 376.0 ± 1.0 mm (14.8 ± 0.04 in) from the

impact surface. The 3.30 mm (0.13 in) diameter holes located on either side of the dummy's head are used to ensure that the head is level with respect to the impact surface. The angle between the lower surface plane of the neck transducer mass simulator (drawing 910420-003) and the plane of the impact surface is 45 ± 1 degrees.

(ii) For a rear impact test, suspend the head assembly with its midsagittal plane in vertical orientation as shown in Figure R2 of this subpart. The lowest point on the back of the head is 376.0 ± 1.0 mm (14.8 ± 0.04 in) from the impact surface. The 3.30 mm (0.13 in) diameter holes located on either side of the dummy's head are used to ensure that the head is level with respect to the impact surface. The angle between the lower surface plane of the neck transducer structural replacement (drawing 910420-003) and the impact surface is 90 ± 1 degrees.

(4) Drop the head assembly from the specified height by a means that ensures a smooth, instant release onto a rigidly supported flat horizontal steel plate which is 50.8 mm (2 in) thick and 610 mm (24 in) square. The impact surface shall be clean, dry and have a micro finish of not less than 203.2×10^{-6} mm (8 micro inches) (RMS) and not more than 2032.0×10^{-6} mm (80 micro inches) (RMS).

(5) Allow at least 2 hours between successive tests of the head assembly at the same impact point. For head impacts on the opposite side of the head, the 30-minute waiting period specified in § 572.155(m) does not apply.

§ 572.153 Neck-headform assembly and test procedure.

(a) The neck and headform assembly (refer to §§ 572.150(a)(1)(ii) and 572.150(a)(1)(iii)) for the purposes of this test consists of parts shown in CRABI neck test assembly (drawing TE-3200-100);

(b) When the neck and headform assembly, as defined in § 572.153(a), is tested according to the test procedure in § 572.153(c), it shall have the following characteristics:

(1) *Flexion.* (i) Plane D referenced in Figure R3 of this subpart shall rotate in the direction of pre-impact flight

with respect to the pendulum's longitudinal centerline not less than 75 degrees and not more than 86 degrees. Within this specified rotation corridor, the peak positive moment about the occipital condyles shall be not less than 36 N-m (26.6 ft-lbf) and not more than 45 N-m (33.2 ft-lbf).

(ii) The positive moment about the occipital condyles shall decay for the first time to 5 N-m (3.7 ft-lbf) between 60 ms and 80 ms after time zero.

(iii) The moment about the occipital condyles shall be calculated by the following formula: $\text{Moment (N-m)} = M_y - (0.005842\text{m}) \times (F_x)$, where M_y is the moment about the y-axis, F_x is the shear force measured by the neck transducer (drawing SA572 -S23) and 0.005842m is the distance from the point at which the load cell measures the force to the occipital condyle.

(2) *Extension.* (i) Plane D referenced in Figure R4 of this subpart shall rotate in the direction of preimpact flight with respect to the pendulum's longitudinal centerline not less than 80 degrees and not more than 92 degrees. Within the specified rotation corridor, the peak negative moment about the occipital condyles shall be not more than -12 Nm (-8.9 ft-lbf) and not less than -23 N-m (-17.0 ft-lbf) within the minimum and maximum rotation interval.

(ii) The negative moment about the occipital condyles shall decay for the first time to -5 Nm (-3.7 lbf-ft) between 76 ms and 90 ms after time zero.

(iii) The moment about the occipital condyles shall be calculated by the following formula: $\text{Moment (N-m)} = M_y - (0.005842\text{m}) \times (F_x)$, where M_y is the moment about the y-axis, F_x is the shear force measured by the neck transducer (drawing SA572 -S23) and 0.005842m is the distance from the point at which

the load cell measures the force to the occipital condyle.

(c) *Test procedure.* (1) Soak the neck assembly in a controlled environment at any temperature between 20.6 and 22.2 °C (69 and 72 °F) and at any relative humidity between 10 and 70 percent for at least four hours prior to a test. These temperature and humidity levels shall be maintained throughout the testing period specified in this section.

(2) Torque the jam nut (drawing 9001336) on the neck cable (drawing ATD-6206) to 0.2 to 0.3 Nm (2-3 in-lbf).

(3) Mount the neck-headform assembly, defined in paragraph (b) of this section, on the pendulum so the midsagittal plane of the headform is vertical and coincides with the plane of motion of the pendulum as shown in Figure R3 for flexion and Figure R4 for extension tests.

(i) The moment and rotation data channels are defined to be zero when the longitudinal centerline of the neck and pendulum are parallel.

(ii) The test shall be conducted without inducing any torsion of the neck.

(4) Release the pendulum and allow it to fall freely to achieve an impact velocity of 5.2 ± 0.1 m/s (17.1 ± 0.3 ft/s) for flexion and 2.5 ± 0.1 m/s (8.2 ± 0.3 ft/s) for extension measured at the center of the pendulum accelerometer at the instant of contact with the honeycomb.

(i) Time-zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. The pendulum data channel shall be defined to be zero at this time.

(ii) Stop the pendulum from the initial velocity with an acceleration vs. time pulse which meets the velocity change as specified in the following table. Integrate the pendulum acceleration data channel to obtain the velocity vs. time curve as indicated in Table B:

TABLE B—PENDULUM PULSE

Flexion			Extension		
Time			Time		
m/s	m/s	ft/s	ms	m/s	ft/s
10	1.6-2.3	5.2-7.5	6	0.8-1.2	2.6-3.9
20	3.4-4.2	11.2-13.8	10	1.5-2.1	4.9-6.9
25	4.3-5.2	14.1-17.1	14	2.2-2.9	7.2-9.5

§ 572.154

§ 572.154 Thorax assembly and test procedure.

(a) Thorax Assembly (refer to § 572.150(a)(1)(iv)). The thorax consists of the part of the torso assembly shown in drawing 921022-060.

(b) When the thorax of a completely assembled dummy (drawing 921022-000) is impacted by a test probe conforming to § 572.155(a) at 5.0 ± 0.1 m/s (16.5 ± 0.3 ft/s) according to the test procedure in paragraph (c) of this section, the peak force, measured by the impact probe in accordance with paragraph § 572.155(a), shall be not less than 1514 N (340.7 lbf) and not more than 1796 N (404.1 lbf).

(c) *Test procedure.* (1) Soak the dummy in a controlled environment at any temperature between 20.6 and 22.2 °C (69 and 72 °F) and at any relative humidity between 10 and 70 percent for at least four hours prior to a test. These temperature and humidity levels shall be maintained throughout the entire testing period specified in this section.

(2) The test dummy is clothed in a cotton-polyester based tight fitting sweat shirt with long sleeves and ankle long pants whose combined weight is not more than 0.25 kg (.55 lbs).

(3) Seat and orient the dummy on a level seating surface without back support as shown in Figure R5 of this subpart, with the lower limbs extended forward, parallel to the midsagittal plane and the arms 0 to 5 degrees forward of vertical. The dummy's midsagittal plane is vertical within ± 1 degree and the posterior surface of the upper spine box is aligned at 90 ± 1 degrees from the horizontal. (Shim material may be used under the upper legs to maintain the dummy's specified spine box surface alignment).

(4) Establish the impact point at the chest midsagittal plane so that the impact point of the longitudinal centerline of the probe coincides with the dummy's midsagittal plane, is centered on the torso 196 ± 2.5 mm (7.7 ± 0.1 in) vertically from the plane of the seating surface, and is within 0.5 degrees of a horizontal plane.

(5) Impact the thorax with the test probe so that at the moment of contact the probe's longitudinal center line falls within 2 degrees of a horizontal line in the dummy's midsagittal plane.

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(6) Guide the test probe during impact so that there is no significant lateral, vertical or rotational movement.

(7) No suspension hardware, suspension cables, or any other attachments to the probe, including the velocity vane, shall make contact with the dummy during the test.

[65 FR 17188, Mar. 31, 2000, as amended at 66 FR 45784, Aug. 30, 2001]

§ 572.155 Test conditions and instrumentation.

(a) The test probe for thoracic impacts, except for attachments, shall be of rigid metallic construction and concentric about its longitudinal axis. Any attachments to the impactor, such as suspension hardware, impact vanes, etc., must meet the requirements of § 572.154(c)(7). The impactor shall have a mass of 2.86 ± 0.02 kg (6.3 ± 0.05 lbs) and a minimum mass moment of inertia of 164 kg-cm^2 ($0.145 \text{ lb-in-sec}^2$) in yaw and pitch about the CG of the probe. One-third of the weight of suspension cables and any attachments to the impact probe must be included in the calculation of mass, and such components may not exceed five percent of the total weight of the test probe. The impacting end of the probe, perpendicular to and concentric with the longitudinal axis of the probe, has a flat, continuous, and non-deformable 101.6 ± 0.25 mm (4.00 ± 0.01 in) diameter face with an edge radius of $7.6/12.7$ mm ($0.3/0.5$ in). The impactor shall have a 101-103 mm (4-4.1 in) diameter cylindrical surface extending for a minimum of 12.5 mm (0.5 in) to the rear from the impact face. The probe's end opposite to the impact face has provisions for mounting an accelerometer with its sensitive axis collinear with the longitudinal axis of the probe. The impact probe shall have a free air resonant frequency of not less than 1000 Hz measured in line with the longitudinal axis of the impactor, using the test method shown in the Procedures for Assembly, Disassembly and Inspection (PADI) document referenced in § 572.151.

(b) Head accelerometers shall have the dimensions, response characteristics, and sensitive mass locations specified in drawing SA572-S4 and be mounted in the head as shown in drawing 921022-000.

(c) The neck force-moment transducer shall have the dimensions, response characteristics, and sensitive axis locations specified in drawing SA572-S23 and shall be mounted for testing as shown in drawing 921022-000 and in figures R3 and R4 of this subpart.

(d) The shoulder force transducers shall have the dimensions and response characteristics specified in drawing SA572-S25 and are allowed to be mounted as optional instrumentation in place of part No. 921022-022 in the torso assembly as shown in drawing 921022-000.

(e) The thorax accelerometers shall have the dimensions, response characteristics, and sensitive mass locations specified in drawing SA572-S4 and be mounted in the torso assembly in triaxial configuration as shown in drawing 921022-000.

(f) The lumbar spine and lower neck force/moment transducer shall have the dimensions and response characteristics specified in drawing SA572-S23 and are allowed to be mounted as optional instrumentation in the torso assembly in place of part No. 910420-003 as shown in drawing 921022-000.

(g) The pelvis accelerometers shall have the dimensions, response characteristics, and sensitive mass locations specified in drawing SA572-S4 and are allowed to be mounted as optional instrumentation in the pelvis in triaxial configuration as shown in drawing 921022-000.

(h) The pubic force transducer shall have the dimensions and response characteristics specified in drawing SA572-S24 and is allowed to be mounted as optional instrumentation in place of part No. 921022-050 in the torso assembly as shown in drawing 921022-000.

(i) The outputs of acceleration and force-sensing devices installed in the dummy and in the test apparatus specified by this part are recorded in individual data channels that conform to the requirements of SAE Recommended Practice J211/1, Rev. Mar95

“Instrumentation for Impact Tests—Part 1—Electronic Instrumentation” (refer to §572.150(a)(3)), with channel classes as follows:

(1) Head and headform acceleration—Class 1000.

(2) Neck :

(i) Forces—Class 1000;

(ii) Moments—Class 600;

(iii) Pendulum acceleration—Class 180;

(iv) Rotation potentiometer response (if used)—CFC 60.

(3) Thorax:

(i) Spine and pendulum accelerations—Class 180;

(ii) Shoulder forces—Class 600;

(4) Lumbar:

(i) Forces—Class 1000;

(ii) Moments —Class 600;

(5) Pelvis:

(i) Accelerations—Class 1000;

(ii) Pubic—Class 1000.

(j) Coordinate signs for instrumentation polarity shall conform to SAE J1733, 1994-12, “Sign Convention For Vehicle Crash Testing, Surface Vehicle Information Report,” (refer to §572.150(a)(4)).

(k) The mountings for sensing devices shall have no resonance frequency within a range of 3 times the frequency range of the applicable channel class.

(l) Limb joints shall be set at 1 g, barely restraining the weight of the limb when it is extended horizontally. The force required to move a limb segment shall not exceed 2 g throughout the range of limb motion.

(m) Performance tests of the same component, segment, assembly, or fully assembled dummy shall be separated in time by period of not less than 30 minutes unless otherwise noted.

(n) Surfaces of dummy components may not be painted except as specified in this subpart or in drawings referenced in §572.150.

[65 FR 17188, Mar. 31, 2000, as amended at 66 FR 45784, Aug. 30, 2001]

FIGURES TO SUBPART R

Figure R 1
FRONTAL HEAD DROP TEST SET-UP SPECIFICATIONS

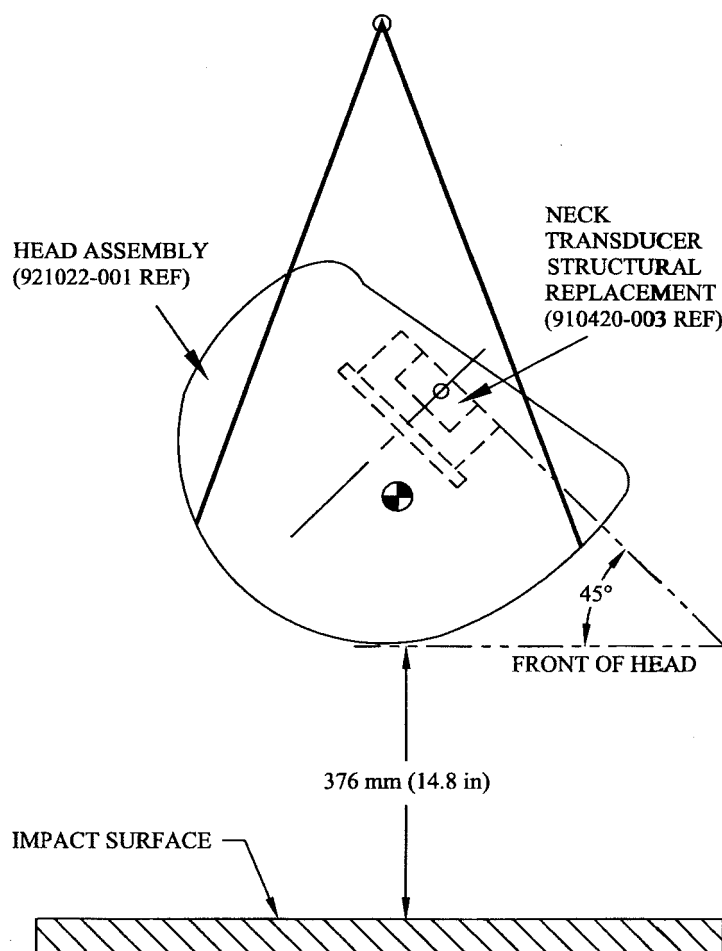


Figure R 2
REAR HEAD DROP TEST SET-UP SPECIFICATIONS

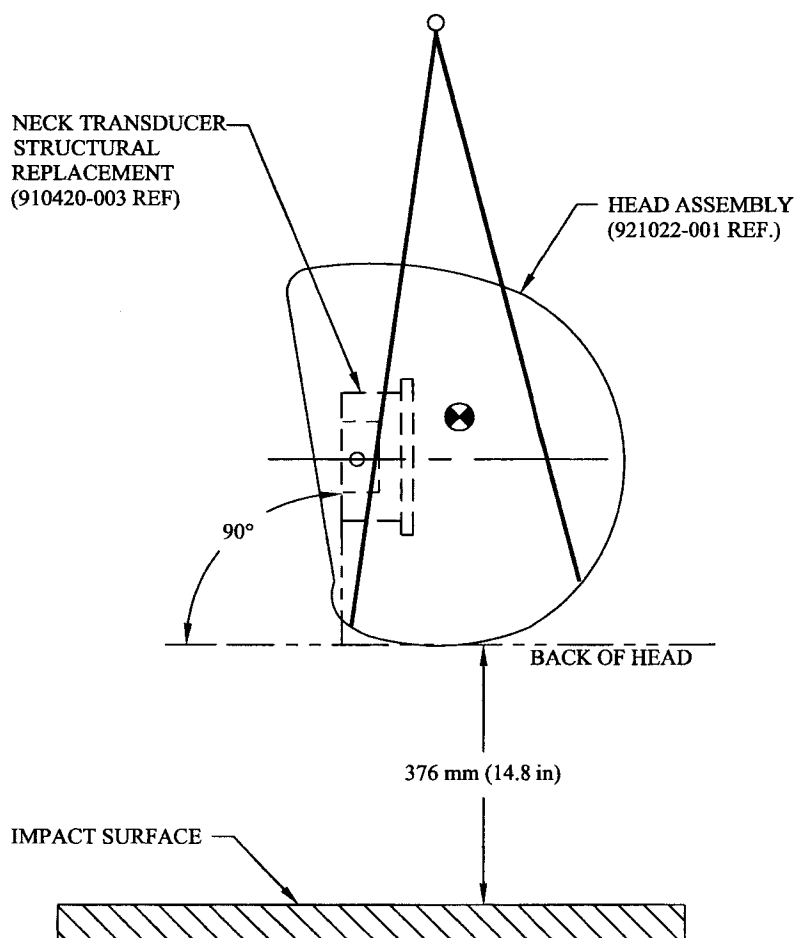
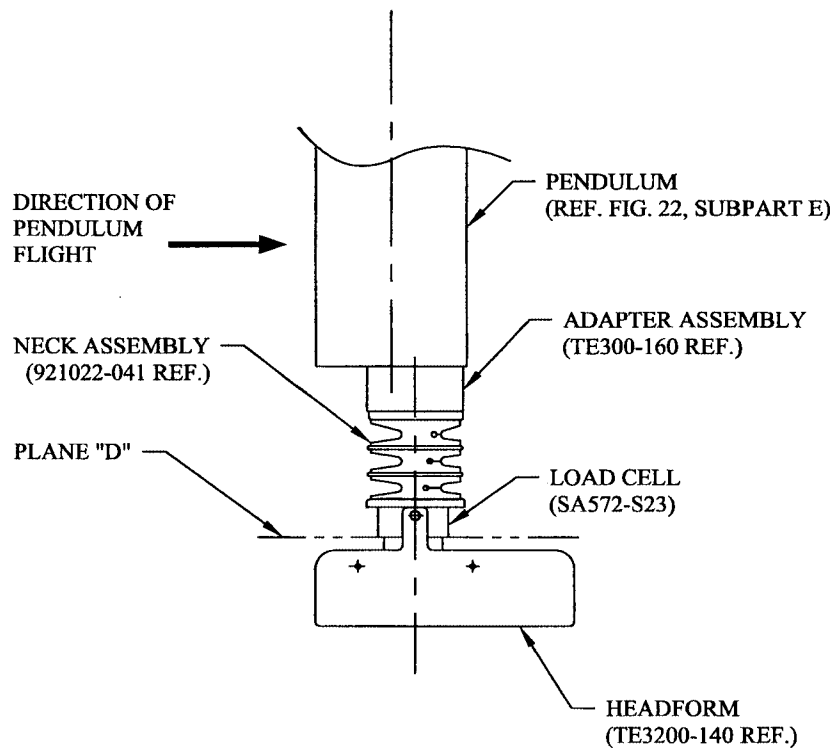
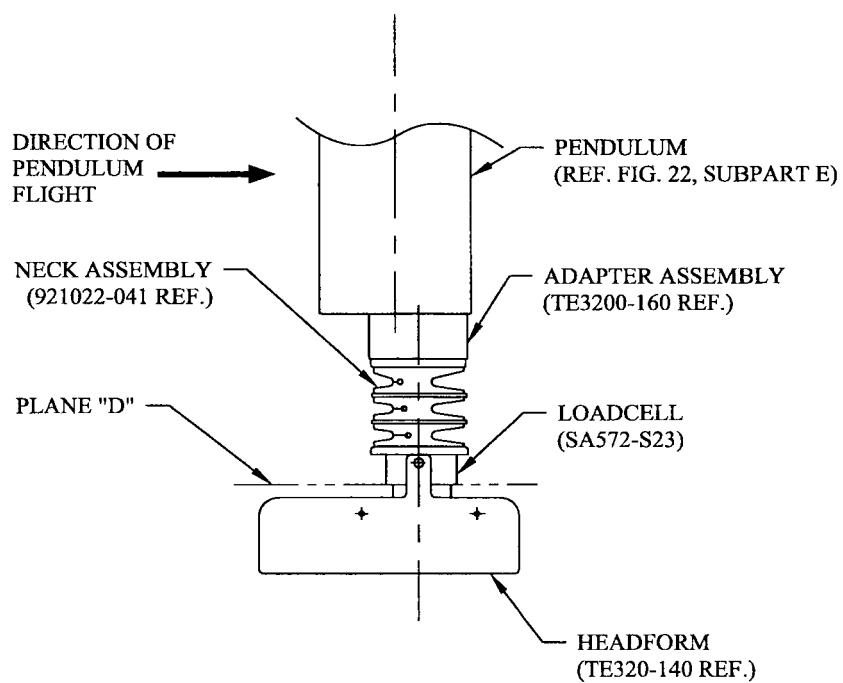


Figure R3
NECK FLEXION TEST SET-UP SPECIFICATIONS



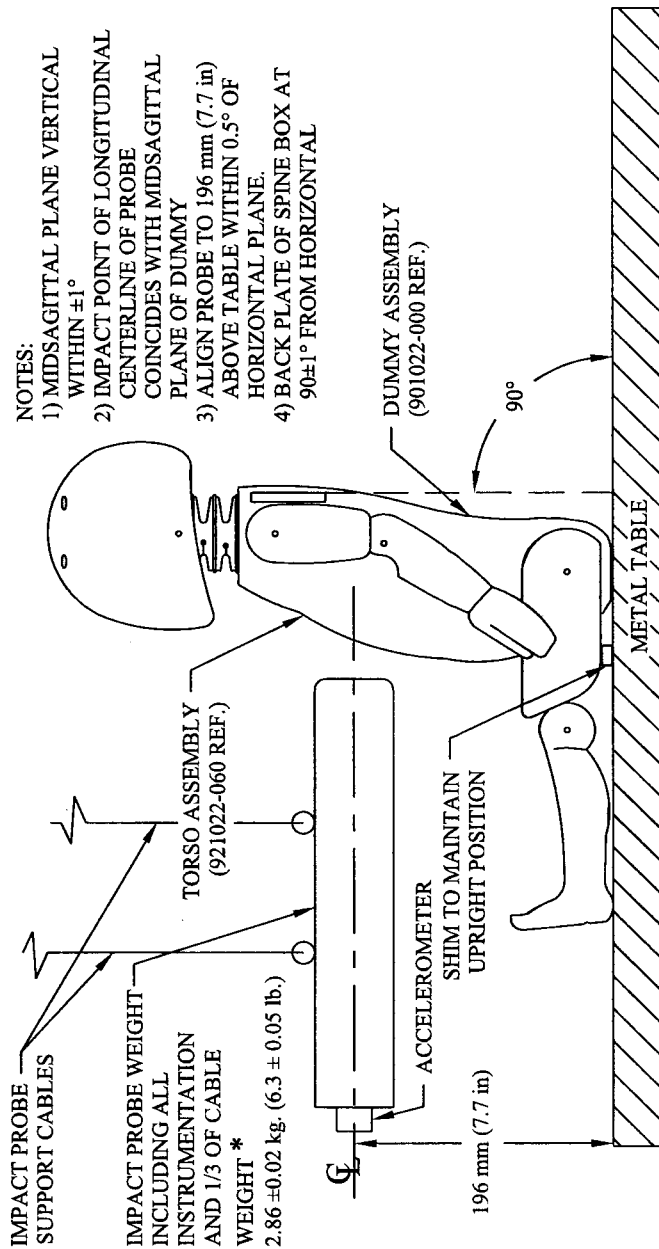
NOTE: MOUNT NECK AT LEADING EDGE OF PENDULUM TO
AVOID INTERFERENCE.

Figure R4
NECK EXTENSION TEST SET-UP SPECIFICATIONS



NOTE: MOUNT NECK AT LEADING EDGE OF PENDULUM TO AVOID INTERFERENCE.

Figure R 5
THORAX IMPACT TEST SET-UP SPECIFICATIONS



* 1/3 OF CABLE WEIGHT NOT TO EXCEED 5% OF THE TOTAL IMPACT PROBE WEIGHT.